Oak Street
UNCLASSIFIED

Areawide Water Quality Management Plan

Part II

Chapter 19

(Fox River Basin)

Public Hearing Draft

northeastern illinois planning commission

208

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NIP

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400 West Madison Street, Chicago, Illinois 60606 (312) 454-0400

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CHAPTER 19: FOX RIVER BASIN

19.01 DESCRIPTION OF THE BASIN

a. Physical Characteristics

Geography

The Fox River drains an area of about 2,600 square miles in northeastern Illinois and southeastern Wisconsin, flowing in a southerly direction from its headwaters near Milwaukee, Wisconsin, to its confluence with the Illinois River in La Salle County, Illinois. Within the NIPC water quality planning area, the basin is approximately 54 miles long and 27 miles wide at its widest point and drains an area of about 960 square miles. Included in the Illinois portion of the basin are parts of all six of the counties in the NIPC 208 area. Terrain is highly variable and hilly, particularly in the Fox River valley, and the river consequently has one of the area's steepest gradients. However, the construction of numerous dams has slowed the river's velocity considerably.

Certain areas in the basin are environmentally sensitive and deserve special attention in clean water planning. The northern half of the basin in Illinois is a complex area of lakes and waterways. More than 500 of the basin's 600 odd wetland areas are over 10 acres in size. Of particular importance are five bogs, four of which are in nature preserves, which are important habitats and are the last of their type in northeastern Illinois. There are 17 nature preserves, prairies, and forest preserves of special environmental concern in the basin; they are similarly concentrated in the north and are important as wildlife habitats. Another area in the basin deserving special protection is a large groundwater recharge area in southeastern McHenry County.

Waterways

The basin has a relatively complex drainage system, consisting of 32 important tributaries and 103 lakes and ponds over 10 acres in size. Twenty-one of the tributaries drain directly into the Fox River, three are tributary to Otter Creek, and one each drains into Ferson Creek, Blackberry Creek, Big Rock Creek, Squaw Creek, Pistakee Lake, Grass Lake, Fox Lake, and Lake Catherine, all eventually draining into the Fox River. These inland waterways are described in Tables 19-1 and 19-2. There are also 14 dams on the Fox River within the basin. These dams create still pools of considerable size and act to slow the flow of the river.

TABLE 19-1 : STREAM INVENTORY, FOX RIVER BASIN

1/2

STREAM NAME	LENGTH (MILES)	AVG. WIDTH (FT.)	WATER SURFACE (ACRES)	GRADIENT (FT/MILE)	DRAINAGE AREA (SQ. MILES)	COMMENTS
BIG ROCK CRK. E. BR	9.0	12.5	12.5	15.6	NA	
BIG ROCK CRK. W. BR	8.5	35.0	36.1	9.4	NA	
BLACKBERRY CREEK	13.3	12.0	19.4	1.2	NA	
BOONE CREEK	6.0	13.0	5.1	5.6	23.0	
BOWES CREEK	4.5	5.0	2.0	29.0	NA	
BREWSTER CREEK	5.6	12.8	6.1	12.6	NA	
COTTON CREEK	6.0	6.5	3.7	11.8	11.0	
CRYSTAL LAKE DRAIN	15.0	3.0	27.1	9.4	22.0	
DUTCH CREEK	6.2	2.5	2.2	20.9	7.6	
EAGLE CREEK	4.8	3.0	1.7	7.0	3.5	
FERSON CREEK	10.0	30.0	36.4	18.0	NA	
FITCHIE CREEK	3.5	3.0	1.3	31.4	NA	
FLINT (FLYNN) CREEK	2.2	8.0	2.1	13.1	NA	
FLYNN CREEK	20.3	10.0	2.5	12.1	27	
FOX RIVER	76.1	294.0	2713.5	2.5	NA	
INDIAN CREEK	5.5	12.0	8.0	16.4	NA	
JELKES CREEK	3.8	8.5	3.9	23.1	NA	
LILY LAKE DRAIN	4.4	3.0	1.8	3.6	NA	
LITTLE ROCK CREEK	1.5	25.0	4.5	7.0	NA	
LONG RUN DITCH	5.0	5.0	3.0	6.0	NA	
MILL CREEK	10.5	20.0	25.6	21.0	NA	
NIPPERSINK CREEK	23.8	40.0	136.7	17.7	269.0	
NORTON CREEK	3.0	10.0	3.7	16.6	NA	
OTTER CREEK	4.5	25.0	14.2	1.1	NA	
POPLAR CREEK	14.4	17.5	29.6	9.7	NA	
SEQUOIT CREEK	7.0	8.0	6.3	7.2	10.9	

TABLE 19-1 : STREAM INVENTORY, FOX RIVER BASIN

2/2

STREAM NAME	LENGTH (MILES)	AVG. WIDTH (FT.)	WATER SURFACE (ACRES)	GRADIENT (FT/MILE)	DRAINAGE AREA (SQ. MILES)	COMMENTS
SPRING CREEK	9.8	18.4	16.5	8.4	27.0	
SQUAW CREEK	15.2	4.0	7.3	6.4	35.0	
STONEY CREEK	3.5	6.0	2.5	28.5	NA	
TREVOR CREEK	0.3	15.0	0.5	13.3	1.0	
TYLER CREEK	14.0	8.0	13.6	14.2	NA	
WELCH CREEK	14.0	17.8	28.8	10.7	NA	
WAUBANSEE CREEK	3.0	10.0	3.6	5.0	10.0	

TABLE 19-2 : LAKE AND POND INVENTORY, FOX RIVER BASIN

1/6

NAME	LOCATION TWP N	 RNGE E	 SECT	SURFACE AREA (ACRES)	SHORE-LINE (MILES)	MAXIMUM DEPTH (FT)	WATER-SHED (ACRES)	DATE CON-STRUCTED	OWNER-SHIP	ACCESSIBILITY
Ackerman's Channels	46	10	18	20.0	2.2	10	150	1940-41	Private	Controlled
Antioch Lake	46	10	17,18	84.0	2.6	10	520	1960	Org.	Permission
Art Baker Lakes	44	10	18	20.0	1.2	13	60	1959	Private	Permission
Baker Lake	42	9,10	1,6	130.0	2.6	10	NA	1934	Public	NA
Bangs Lake	44	9	24, 25,26	297.0	3.1	25	960	Natural	Public	Boat Liveries City Ramp
Bluff Lake	44	9	24	86.0	1.6	31	600	Natural	Org.	Fee
Bode Lake - South	41	9	14	10.0	0.7	23	NA	1958	Public	NA
Breeden Slough	44	9	13	38.0	2.1	9	340	Natural	Private	Owners & Friends
Bull Valley Hunt Club Lake	45	7	36	53.0	2.3	15	NA	1959	Org.	Members & Guests
Campton Lake	40	7	15	30.6	1.9	11	NA	1953	Org.	NA
Cedar Lake	46	10	32	285.0	3.2	40	700	Natural	Public	Resorts Village Beach
Channel Lake	46	9	1,2,11 12,14	352.0	3.6	42	3600	Natural	Public	Chain o Lakes Park
Crabtree Lake	42	9	15	45.5	1.0	9	NA	1934	Public	NA
Cranberry Lake	45	10	28	44.0	0.6	15	140	Natural	Private	Controlled
Crescent Lake	38	8	32	15.8	1.5	7	NA	1909-30	Org.	NA
Cross Lake	46	10	5	25.0	0.8	34	118	Natural	Org.	None
Crystal Lake	43	7	1-6	228.0	2.8	30	NA	Natural	Public	Resorts, City Park
Davis Lake	44	10	29	36.4	1.1	17	504	Natural	Private	None
Defiance Lake	44	9	6	47.8	1.3	25	NA	Natural	Private	Resorts & Friends

* Org - Organizational

TABLE 19-2 : LAKE AND POND INVENTORY, Fox River BASIN

2/6

NAME	LOCATION			SURFACE AREA (ACRES)	SHORE-LINE (MILES)	MAXIMUM DEPTH (FT)	WATER-SHED (ACRES)	DATE CON-STRUCTED	OWNER-SHIP	ACCESSIBILITY
	TWP N	RNGE E	SECT							
Deep Lake	46	10	33,34	200.0	2.8	52	600	Natural	Org.	Permission or Fee
Duck Lake	45	9	14,15	99.0	3.9	8	3562	Natural	Org.	Fee
Dunn's Lake	46	9	33	60.0	2.9	9	50	Natural	Org.	None
East Loon Lake	46	10	21	164.0	2.3	26	1000	Natural	Org.	Fee
Echo Lake	43	10	17	25.0	1.0	9	1480	Natural	Org.	Members Only
Elizabeth Lake	46	8	2,3	32.0	1.0	25	NA	Natural	Public	Boat Liveries
Fox - Nappersink Lake	45	9	2-4 33,34	2120.0	12.2	22	1300	1939	Public	Resorts & Marinas
Galvin Lake	42	9	17	19.5	0.9	10	NA	1934	Public	NA
Golden Oaks - Farm Lake	44	9	15,22	17.0	1.0	11	600	1965	Org.	Permission
Goose Lake	42	9	9	65.0	0.6	5	NA	Natural	Private	NA
Grass Lake	46	9	34	1360.0	8.5	6	NA	Natural	Public	Chain o'Lakes State Park or Fee
Grassy Lake	43	9	14	50.0	1.4	12	2720	Natural	Org.	Members & Friends
Grays Lake	45	10	27,34	65.0	1.9	19	400	Natural	Public	Through Park District
Griswold Lake	44	9	17,18	141.0	1.6	13	NA	Natural	Public	Two Resorts
Hawley Lake	42	9	10,11	65.8	1.8	9	NA	1930	Org.	NA
Hawthorne Lake	42	9	2,11	28.5	1.0	9	NA	NA	Org.	NA
Herrick House Lake	41	9	33,34	11.3	0.6	9	NA	Natural	Org.	NA
Highland Lake	45	10	21,22	110.0	1.5	35	700	Natural	Org.	Permission
Honey Lake	43	9	13	55	1.2	19	590	Natural	Org.	Members & Friends

Org. - Organizational

TABLE 19-2 : LAKE AND POND INVENTORY, Fox River BASIN

3/6

NAME	LOCATION			SURFACE AREA (ACRES)	SHORE-LINE (MILES)	MAXIMUM DEPTH (FT)	WATER-SHED (ACRES)	DATE CON-STRUCTED	OWNER-SHIP	ACCESSIBILITY
	TWP N	RNGE E	SECT							
INDIAN LAKE	43	9	11	85.0	2.2	19	355	1930	Private	Restricted
ISLAND LAKE	44	9	20	78.2	4.0	13	NA	1940	Org.	NA
KEENE LAKE	42	9	11	48.2	1.7	15	NA	1944	Org.	NA
LA BUYS LAKE (WEST)	42	9	14	14.2	0.9	10	NA	1948-9	Public	Closed to Public
LACEY LAKE	42	9	4	18.5	1.2	12	NA	Natural	Org.	Owners Only
LAKE CATHERINE	46	9	1,12	115.0	2.0	45	3600	1939	Public	Chain O'Lakes State Park
LAKE DUNCAN	45	9	34,35	85.0	1.7	16	6829	1935	Org.	Fee
LAKE FAIRVIEW	44	9	35	16.0	0.9	12	75	1969	Org.	Restricted
LAKE HELEN	44	9	12	17.0	0.7	9	120	1968	Org.	Restricted
LAKE IN THE HILLS	43	8	20	52.0	2.2	35	NA	1930	Org.	Home Owners
LAKE IN THE HILLS # 2	43	8	28	11.0	0.8	10	NA	1953	Org.	Association
LAKE KILLARNEY	43	8	1,2	57.7	1.8	19	NA	Natural	Org.	Association
LAKE LOUISE	43	10	31	40.0	1.4	14	850	1967	Org.	Restricted
LAKE MARIE	46	9	12,14 24	480.0	6.0	35	4200	1939	Public	8 Resorts & Marinas
LAKE OF THE COVES	42	9	26,27	81.5	2.7	12	NA	1969	Org.	Owners only
LAKE OF THE HOLLOW	45	9	21	51.0	2.4	15	400	1970	Org.	Restricted
LAKE OF THE WOODS	42	9	4	14.8	1.0	7	NA	1930	Org.	Owners Only
LAKE ZURICH	43	10	17-20	228.0	3.2	32	1240	Natural	Org.	Fee Resort
LAKEFIELD LAKE	44	10	4	19.4	0.9	12	180	1927	Private	None

TABLE 19-2 : LAKE AND POND INVENTORY, ________________ BASIN

NAME	LOCATION			SURFACE AREA (ACRES)	SHORE-LINE (MILES)	MAXIMUM DEPTH (FT)	WATER-SHED (ACRES)	DATE CON-STRUCTED	OWNER-SHIP	ACCESSIBILITY
	TWP N	RNGE E	SECT							
LAKELAND ESTATES LAKE	44	9	34,35	15.0	0.6	15	NA	1956	Org.	Restricted
LAKEWOOD FOREST PRES. LAKES	44	10	30,31	22.5	2.2	27	300	1950	Public	Via Forest Preserves
LILY LAKE	45	9	32,35	89.0	3.8	16	NA	Natural	Org.	Fee Resort
LITTLE SILVER LAKE	46	10	9,16	41.2	1.2	21	100	1960	Org.	Fee
LITTLE WONDER LAKE	45	7	24	11.4	0.5	8	NA	1964	Private	None
LONG LAKE	45	9,10	13,24	335.0	4.4	30	26,880	1930	Org.	Fee
LOWER WEST LAKE	42	8	26	10.1	1.4	18	NA	1951	Org.	NA
LUCKY 50 CLUB LAKE	38	8	29	50.0	2.2	16	NA	1944	Org.	NA
McCOLLUM LAKE	45	8	22	245.0	2.9	10	NA	1890	Org.	No Public Access
MARIAN LAKE	42	8	11	11.6	0.9	38	NA	1949	Org.	NA
MARY LEE LAKE	44	10	27	14.0	0.8	8	150	1952	Org.	Restricted
MASTODON LAKE	38	8	26,35	22.3	2.1	9	NA	1933-4	Public	NA
MIGHELL PARK LAKE	38	7	25	25.0	1.1	26	NA	1957	Public	NA
MOOSEHEART LAKE	39	8	28	19.0	2.0	11	NA	1914	Org.	NA
NELSON LAKE	39	7	25	25.3	1.0	4	NA	Natural	Private	NA
NUTRI-SOIL LAKE	45	9	29	12.0	1.4	8	NA	1950	Org.	Restricted
PARKER'S JEWELWOOD LAKE	44	7	13	10.0	1.8	10	NA	1951	Private	Permission
PECK LAKE	39	8	18	16.0	0.8	5	NA	1964	Private	NA
PEPPER LAKE	43	9	21	10.0	1.0	40	NA	1955	Private	Fee Fishing Area

TABLE 19-2 : LAKE AND POND INVENTORY, ____________ BASIN

NAME	LOCATION			SURFACE AREA (ACRES)	SHORE-LINE (MILES)	MAXIMUM DEPTH (FT)	WATER-SHED (ACRES)	DATE CON-STRUCTED	OWNER-SHIP	ACCESSIBILITY
	TWP N	RNGE E	SECT							
PETITE LAKE	46	9,10	25,30, 36	167.0	2.0	22	1000	1939	Public	Fee Resort
PISTAKEE LAKE	45	9	9,16	1700.0	11.8	31	1700	1939	Public	18 Fee Resorts & Marinas
PRATT'S WAYNE WOODS LAKE NO. 1	40	9	7	16.2	0.8	22	NA	1920	Public	Through Forest Preserve
PRESTBURY LAKE	38	7	15	18.1	0.9	13	NA	1966	Org.	NA
RAY'S LAKE	44	10	17	15.0	0.9	8	500	Natural	Private	Permission
REDHEAD LAKE	45	9	15,16, 21	45.0	1.1	7	260	1939	Public	via Channel from Pistakee
ROUND LAKE	45	10	21	215.0	2.3	35	500	1950	Public	Fee
RYANS (ORCHARD) LAKE	42	9	3	13.5	0.7	8	NA	1940	Org.	Owners Only
SHEFFIELD TOWN LAKE	41	10	18	10.5	0.7	12	NA	1970	Org.	NA
SILVER LAKE	44	8	36	36.0	1.4	14	NA	1929	Org.	Restricted
SLOCUM LAKE	44	9	28	220.0	2.7	10	3940	1900	Org.	Fee Resorts
SPRING GROVE HATCHER LK.	44	8	25	20.0	2.0	6	NA	1913	State	None
SPRING LAKE	42	9	5	32.0	0.7	9	NA	Natural	Public	Open to Public
SULLIVAN LAKE	45	9	28,33	45.0	2.0	9	200	Natural	Org.	Restricted.
SUN LAKE	46	10	28	30.8	2.3	NA	700	Natural	Private	Controlled
THUNDERBIRD LAKE	44	8	23	75.0	3.0	10	NA	1956	Org.	NA
TIMBER LAKE	44	9	36	31.2	1.1	18	450	1949	Org.	Restricted
TOWER LAKE	43	9	2	70.0	2.5	10	385	1915	Org.	Restricted
TURNER LAKE	46	9	21	34.0	1.1	10	500	Natural	State	Open to Public

TABLE 19-2 : LAKE AND POND INVENTORY, FOX RIVER BASIN

6/6

NAME	LOCATION			SURFACE AREA (ACRES)	SHORE-LINE (MILES)	MAXIMUM DEPTH (FT)	WATER-SHED (ACRES)	DATE CON-STRUCTED	OWNER-SHIP	ACCESSIBILITY
	TWP N	RNGE E	SECT							
WALTEN HOLLOWAY LK.	44	10	20	28.0	0.8	9	175	1940	Private	Controlled
WEST LOON LAKE	46	10	20,21	165.0	2.0	37	500	Natural	Org.	Fee Resorts
WILLOW LAKE ESTATES LAKE	41	8	1	14.0	1.3	13	NA	1900	Org.	NA
WILLOW WING LAKE	42	8	17	17.0	0.8	15	NA	1947	Private	NA
WONDER LAKE	45	7	7,13	730.0	12.0	13	NA	1925	Org.	Restricted
WOOSTER LAKE	45	9	23	100.3	1.8	32	1200	Natural	Org.	Fee Resorts
ZIEGLER LAKE	46	9	15,16	50.0	2.0	10	400	1955	State	Chain O'Lakes St.Pk.

Geology

Unconsolidated glacial deposits range in depth from a few feet along portions of the Fox River valley to more than 300 feet in the morainic uplands of Lake and McHenry counties. The dominant deposit is till, found throughout most of the basin but usually buried below younger deposits. Till is relatively impermeable; groundwater infiltration capability is limited and, as a result, the application of wastes, fertilizers, or agrichemicals to it presents the risk of polluting stormwater which, in turn, can pollute surface waters.

Deposits of sand and gravel are found in valley trains, in broad outwash plains and in ice-contact deposits in the northernmost portions of the basin. Infiltration is rapid in these deposits, and pollutants may enter groundwater as a result of leachate from landfills, discharges from septic tanks, and surface applications of wastes, fertilizers, or agrichemicals.

Glacial lake and windblown deposits are found in widely scattered areas of the basin, filling depressions in till and outwash plain areas. Usually fine grained, these materials have low permeability, and runoff to surface waters can be a problem. For this reason, septic tanks and landfills will usually not function well in these materials.

Soil conditions limit septic tank usage in most of the basin. In the northern half of the basin, ground conditions causing septic tank problems include high infiltration capacity, low conductivity, poor surface drainage, and steep slopes. Restrictions in the southern half of the basin are generally less severe with some areas having little or no restrictions for septic tank usage. Most severely restricted are areas in which aquifers lie close to the surface, notably in some parts of the northern half of the basin and in the Kane County portion of the Fox River valley. Figure 19-2 shows areas not suited for septic tank usage.

Predominant soils in northeastern Illinois are described in Chapter Four. Soils occurring in this basin are identified in Table 19-3

b. Socio-economic Characteristics

Population

The estimated 1975 population of the basin was 545,424, representing 15 percent of the combined 1975 populations of Du Page, Kane, Lake, McHenry, and suburban Cook counties. The population density (569 persons per square mile) is one of the lowest in northeastern Illinois. Rates of population change are presented and compared with rates of population change in the region and in Du Page, Kane, Lake, McHenry and suburban Cook counties in Table 19-4.

The largest communities in the basin in 1975 were Aurora and Elgin, and the smallest were Hainesville and Pingree Grove. Most of the basin's communities had high rates of growth between 1950 and 1975. Table 19-4 provides population forecasts for facility planning areas in the basin. A continuation of high rates of growth is forecast throughout the basin. Projected wasteloads, which are discussed later in this chapter, are based on these population projections as well as commercial, industrial, and extraneous loads.

Figure 19-1: BASIN LOCATION

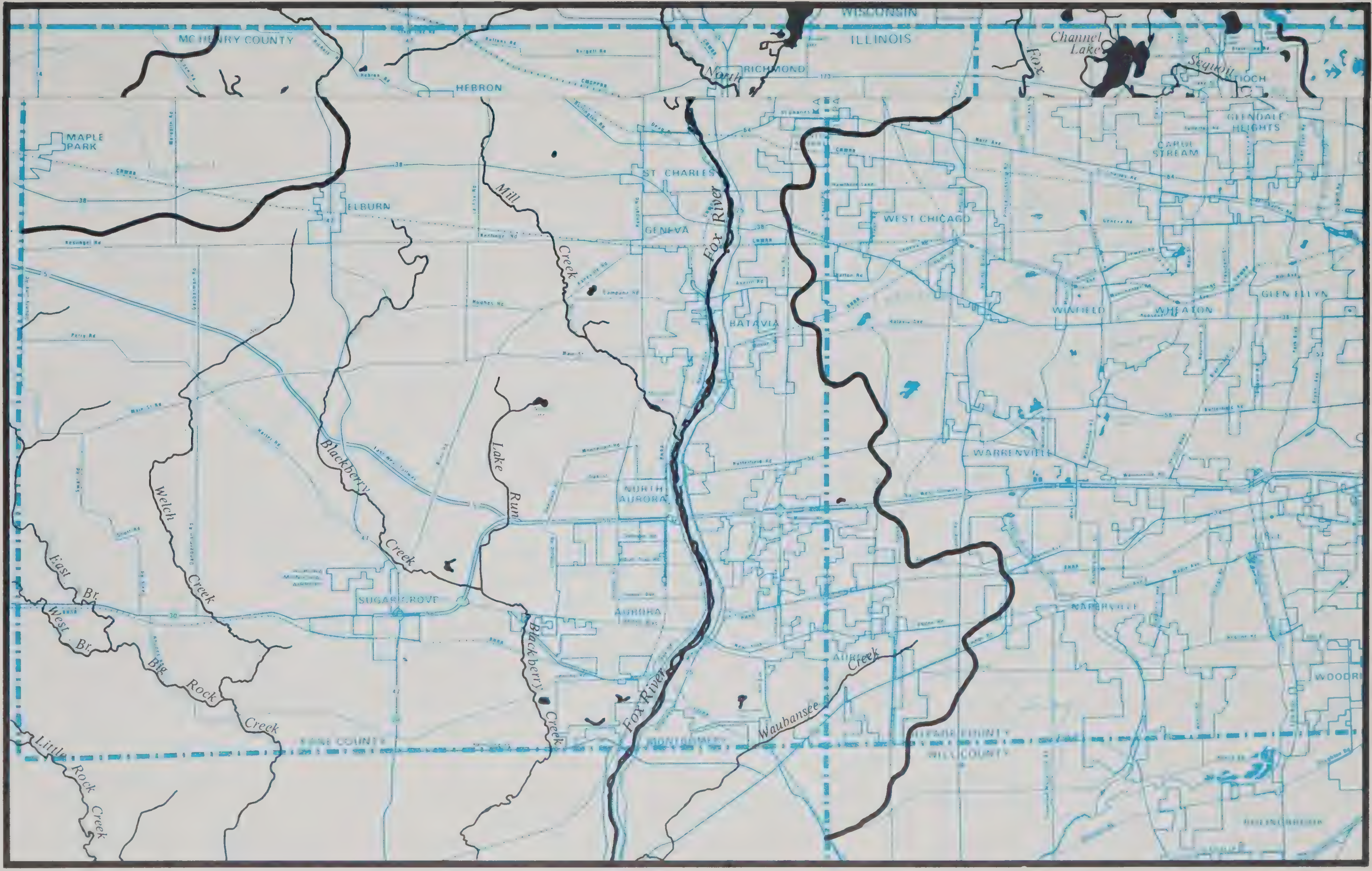


Figure 19-1: BASIN LOCATION

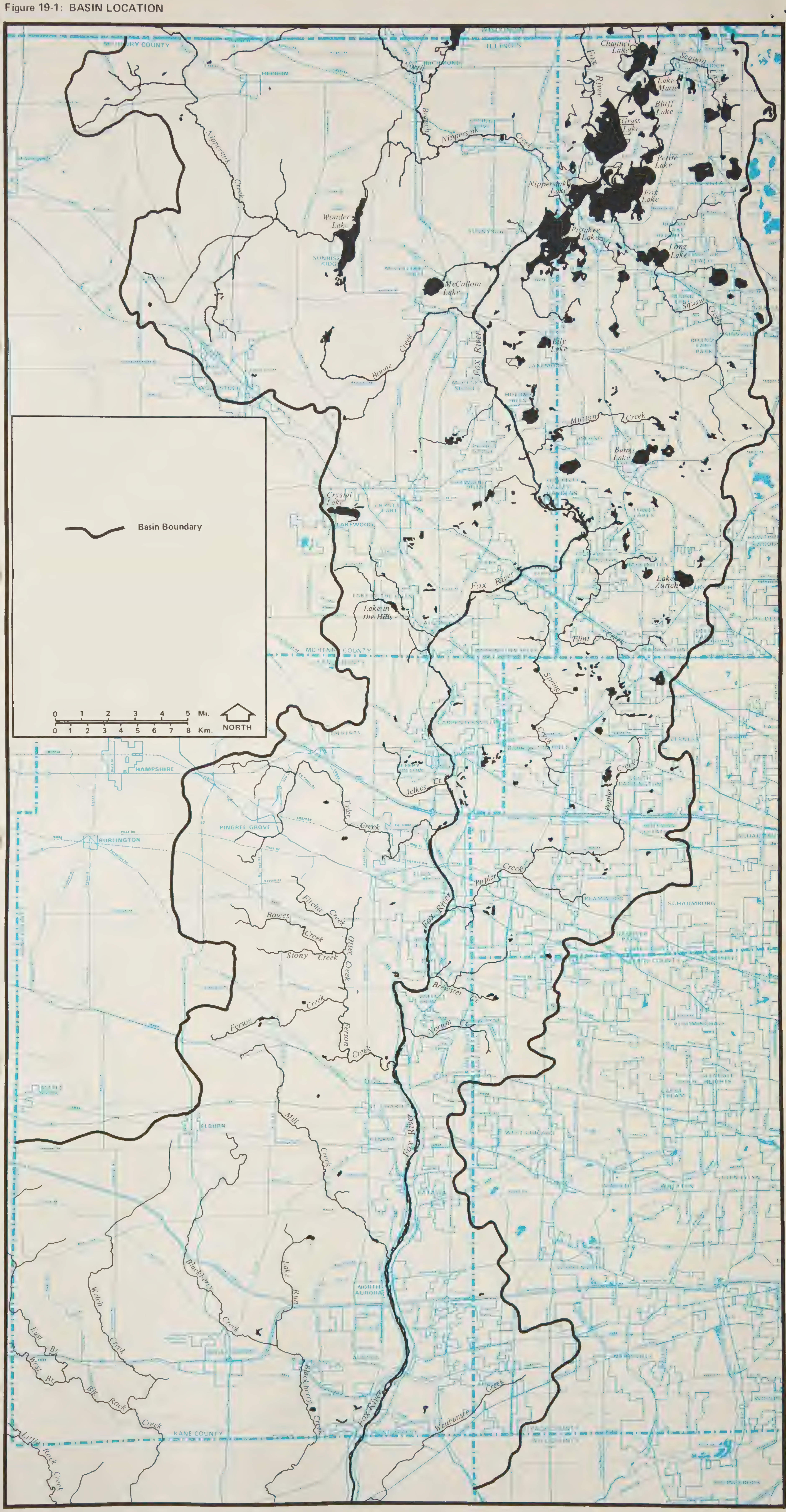


TABLE 19-3: PREDOMINANT SOIL UNIT CHARACTERISTICS FOR NORTHEASTERN ILLINOIS

Unit In Basin	Soil Unit	Soil Color	Soil Texture	Permeability	Drainage	Subsoil Texture	Underlying Materials	Agricultural Usage Limitations	Approximate Percentage of Prime Agri. Land	Development Usage Limitations
YES	Fox-Dresden-Casco	brown	loam	mod-rapid	well	loam	sand and gravel	E, D, LF	12	S, E, ST
YES	Warsaw-Rodman-Lorenzo	brown	loam	moderate	well	loam	sand and gravel	E, D	50	S, E, ST
	Volinia-Selma-Lomax	brown	loam	moderate	excessive	loam	sand	WE, D, W	80	W, S, P
	Maumee-Watseka-Plainfield	black	loamy sand	rapid	excessive	sand	sand	W, WE, D	30	S, W
YES	Zurich-Grays-Wauconda	gray	silt loam	moderate	moderate	clay loam	silt loam	W, E, LF	90	S, W, ST
YES	Drummer-Brenton-Proctor	brown	silt loam	moderate	moderate	clay loam	loam	W, E	100	W, S, P
YES	Miami-Kidder-McHenry	gray-brown	loam	moderate	well	clay loam	loam	E, ST, LF	40	ST, S, SS
YES	Drummer-Saybrook-Lisbon	dark gray	silt loam	moderate	moderate	clay loam	loam	W, E	80	W, S, SP, SS
YES	Ringwood-Griswold	brown	loam	moderate	well	clay loam	sandy loam	E, W	85	S, W, ST
YES	Morley-Markham-Ashkum	gray	loam	slow	moderate	silty clay	clay loam	E, W, LF	60	ST, SP, SS, W, HC
YES	Elliot-Ashkum-Beecher	dark gray	silt loam	slow	moderate	silt loam	clay loam	W, E	85	W, SP, CS, SS
YES	Milford-Martinton	black	silt loam	mod. slow	poor	silty clay	calcareous sediment	W	95	W, HC, P, SP, SS
	Symerton-Andres-Ashkum	black	silt loam	moderate	moderate	clay loam	clay loam	E, W	95	W, SP, SS
YES	Nappanee-Peotone-Del Rey	dark gray	silt loam	slow	well	silt loam	calcareous sediment	W, T, LF, E	50	W, SP, HC, P
YES	Frankfort-Bryce-Montgomery	dark brown	silt loam	slow	poor	silty clay	calcareous sediment	W, T, LF, E	5	W, SP, HC, P
YES	Romeo-Joliet	black	loam	moderate	poor	loam	limestone	W,STN, FL	60	W, SH, FL, SS
YES	Otter-Huntsville-Millington	black	loam	moderate	moderate	loam	loam	FL, W	95	W, FL
YES	Fox-Wauconda-Sawmill	dark gray	silt loam	moderate	poor	loam	sand	W, FL, E	75	W, FL
YES	Houghton-Lena	black	muck/peat	rapid	poor	muck/peat	sand/silt	HWT, W	0	W, P, S, HWT, LS

USAGE LIMITATION CODES

CODE	LIMITATION	CODE	LIMITATION	CODE	LIMITATION	CODE	LIMITATION
CS	Clayey Subsoil	D	Drouthiness	E	Erosion	FL	Flooding
HC	Heavy Clayey Subsoil	HWT	High Water Table	LF	Low Fertility	LS	Low Strength
P	Ponding	S	Seepage	SH	Shallowness to Bedrock	SP	Slow Percolation
SS	Shrink-Swell	ST	Steepness	STN	Stoniness	T	Soil Tilth
W	Wetness	WE	Wind Erosion				

TABLE 19-4 : POPULATION CHANGE 1975-2000

FACILITY PLANNING AREAS	1975	1980	1985	1990	1995	2000	% Change 1975-2000
AURORA FPA	112,200	117,610	139,980	162,350	178,200	208,800	86.1
BARRINGTON FPA	33,840	39,520	48,190	56,860	65,720	74,580	120.4
BATAVIA FPA	12,420	13,670	15,980	18,600	20,000	21,490	73
CARPENTERSVILLE FPA	24,900	31,400	35,100	38,800	40,400	42,000	68.7
EASTERN KANE FPA	31,100	36,850	44,640	52,520	57,330	62,140	99.8
ELBURN FPA	2,200	2,300	3,500	4,600	4,800	5,200	136.4
ELGIN FPA	113,200	133,800	154,000	174,100	188,500	202,900	79.2
FOX RIVER GROVE FPA	3,400	4,100	5,200	6,200	6,700	7,200	111.8
GILBERTS FPA	500	600	1,000	1,300	1,900	2,500	400
HEBRON FPA	1,000	1,000	1,100	1,100	1,200	1,300	30
ISLAND LAKE FPA	8,840	9,710	10,590	11,460	12,300	13,400	51.6
LAKE IN THE HILLS FPA	4,700	6,000	6,300	6,600	7,100	7,500	59.6
LAKE ZURICH FPA	6,800	10,600	13,600	16,600	19,800	23,000	238.2
McHENRY FPA	17,600	21,700	27,700	33,600	37,400	42,100	139.2
NORTHWEST LAKE FPA	51,100	59,000	69,000	79,000	87,000	95,000	85.9
PINGREE GROVE FPA	300	400	400	500	500	500	66.7
SOUTH DUNDEE FPA	11,000	11,400	12,800	14,200	15,300	16,400	49.1
SOUTHEAST McHENRY FPA ALGONQUIN SUB-FPA	6,500	10,000	11,500	13,000	14,500	16,000	146.2
S.E.McHENRY FPA-CRYSTAL LAKE-LAKEWOOD SUB-FPA	23,000	31,800	34,500	37,200	43,800	50,500	119.6
S.E.McHENRY FPA-CARY OAKWOOD HILLS SUB-FPA	10,600	11,400	13,500	15,500	19,600	23,600	122.6
RICHMOND FPA	1,400	1,600	1,700	1,900	2,100	2,300	64.3
SPRING GROVE FPA	1,400	1,800	2,000	2,200	2,300	2,400	71.4
SUGAR GROVE FPA	2,000	2,200	2,800	3,400	3,800	4,100	105.0
SUNNYSIDE FPA	5,900	6,300	7,100	7,900	10,000	11,100	88.1
WASCO FPA	301	331	438	545	640	735	144.2
WAUCONDA FPA	8,570	9,650	10,730	11,800	12,360	12,920	50.8
WAYNE FPA	1,250	1,300	1,550	1,790	2,500	3,360	168.8

Source: Northeastern Illinois Planning Commission

TABLE 19-4 : POPULATION CHANGE 1975-2000

FACILITY PLANNING AREAS	1975	1980	1985	1990	1995	2000	% Change 1975-2000
WONDER LAKE FPA	7,600	8,400	8,900	9,300	9,900	10,000	31.6
WOODSTOCK	14,020	15,450	18,170	20,890	24,280	27,660	97.3
FPA TOTALS	517,641	599,891	701,968	803,815	889,930	990,685	91.4
BASIN TOTAL	545,424	580,226	672,526	764,827	850,834	936,300	71.7

Source: Northeastern Illinois Planning Commission

Land Use

There is a wide range of land use in the Fox River basin, though most of the basin remains in the land use category of vacant, agricultural, and forest areas (Table 19-5). The northernmost part of the basin is a mixture of dairy farms, lakes, and resort towns, while that portion of the basin south of Lake and McHenry counties is typified by cropland, old farming communities, the western edge of Chicago's suburbs, and the heavily urbanized old industrial cities on the Fox River. Some heavy concentrations of commercial and industrial land use are found in or near the cities, which are built either on the bluffs along the river or in the river valley itself.

Most of the public and quasi-public open space in the basin is contained in large forest preserve areas in Cook County and in the northernmost portion of the basin. Mining includes three limestone quarries in Kane County; scattered sand and gravel pits, usually along the Fox River valley; and a number of peat pits.

NIPC land use forecasts anticipate increasing urbanization, with accompanying changes in land use, as indicated in Table 19-6. The largest proportionate increases are forecast in nonresidential land use categories, particularly in land for manufacturing and commercial purposes. The amount of undeveloped (open, vacant, agricultural) land is forecast to decrease by approximately 15 percent by the year 2000.

Economy

Employment in the basin is dominated by manufacturing, although in recent years manufacturing employment has not grown as rapidly as employment in the service industries. Employment in agriculture, finance, real estate, government, and retail trade has grown at a somewhat higher rate than employment in manufacturing.

The total number of people employed in the basin was 139,637 in 1970 and this number is forecast to increase by 65 percent, to 230,219 by the year 2000. Table 19-7 indicates substantial increases between 1980 and 2000 in all categories of employment.

Water Supply

Lake Michigan is now, and will continue to be, the major source of water supply for northeastern Illinois. About 5 million people in Chicago and 89 other communities use lake water. However, in the Fox River basin, groundwater pumpage is the sole source of water supply. Shallow sand and gravel wells account for 61 percent of groundwater pumpage, shallow dolomite wells account for 10 percent, and deep sandstone wells, for 29 percent.

The Fox River basin includes parts of 54 townships, all or portions of 63 incorporated municipalities, 57 sanitary districts, and 51 other special districts.

Recreation

By virtue of its many lakes and hills, the northern portion of the Fox River basin has become what is probably the major recreational

TABLE 19-5 1970 LAND USE

Land Use Category	Total Acres	% of Total
Single Family Residential	45,620	7.4
Multi Family Residential	660	.1
Mobile Home Parks	158	0
Manufacturing and Processing	2,757	.4
Transportation, Communications, & Utilities	2,077	.3
Railroad Rights-of-way	3,390	.6
Airports	975	.2
Streets & Parking	22,642	3.7
Trade	1,776	.3
Services-Private	568	.1
Services-Institutional	5,938	1.0
Military Services	4	0
Cemetaries	755	.1
Entertainment Assembly	272	0
Public Buildings	224	0
Public and Quasi-Public Open Space	21,297	3.5
Mining and Quarries	5,870	1.0
Vacant, Agricultural & Forest Areas	476,216	77.6
Vacant-Under Development	2,477	.4
Water	19,324	3.2
Warehousing	387	.1
Shopping Centers	190	0
Hotels-Motels	133	0
Parking Lots	305	0
Total	614,015	100

TABLE 19-6: LAND USE FORECASTS (ACRES)

Land Use Category	1980	1985	1990	1995	2000
Residential	55,415	61,048	66,680	72,313	77,946
Manufacturing	10,229	14,392	18,554	22,368	26,182
Commercial	9,205	13,166	17,127	20,761	24,395
Transportation/Communication, etc.	23,899	29,849	35,798	41,172	46,546
Open Space, Vacant Agriculture, etc.	515,627	495,560	475,856	457,401	438,946
Total	614,015	614,015	614,015	614,015	614,015

SOURCE: Northeastern Illinois Planning Commission, 1976

TABLE 19-7 : EMPLOYMENT FORECAST

CATEGORY	1970	1980	1985	1990	1995	2000	1970-2000 % Increase
Manufacturing	50,704	57,626	59,558	61,491	66,086	70,682	39.8
Local Retail	16,994	22,226	23,109	23,992	25,942	27,892	64.1
Other	71,939	102,704	110,069	117,432	124,539	131,645	83.0
Total	139,637	182,556	192,736	202,915	216,567	230,219	64.9

Source: Northeastern Illinois Planning Commission

area in the region. A number of lakes have facilities for boating, fishing, and swimming. Winter sports include tubing, cross-country skiing, tobogganing, and ice skating. In many of the lake communities, a high proportion of the homes are used only as summer or weekend retreats. Additional recreational opportunities, including camping, are available at Chain-O-Lakes State Park and Moraine Hills State Park.

19.02 EFFECTS OF OTHER PROJECTS

In many basins there are studies or projects underway which may directly or indirectly affect surface and/or groundwater quality. Most will have indirect effects, since they usually pertain to water quantity or hydrologic modifications. Included in these classifications are the flood control activities of the U.S. Soil Conservation Service (SCS), the U.S. Army Corps of Engineers, and the Illinois Division of Water Resources. The soil conservation programs of the SCS also have an influence on water quality.

There are many local,county, state and federal public works projects which can affect water bodies. Perhaps the most significant is the construction or improvement of roads and highways. In those instances, drainage patterns may be altered, local farm tiles may be interrupted, silt may be introduced into streams, and vehicular pollutants may be conveyed to rivers and streams. Waterway crossings by highway projects and similar crossings by various public and private utilities all affect water quality to varying degrees and for various lengths of time. Not to be overlooked are public and private storm sewer outlets which may be authorized in the future.

As can be seen, there are a wide variety of projects which affect water quality. However, in this section, attention will be given only to those with significant potential impact.

Corps of Engineers

The U.S. Army Corps of Engineers has a variety of responsibilities relating primarily to navigation and flood control

1. Navigation

   The Corps has general jurisdiction over navigable waters of the United States.

   The Fox River is not considered by the Corps to be navigable, since it does not sustain commercial navigation. As a result, it does not fall under the Corps' jurisdiction.

2. Wastewater Studies

   Pursuant to Section 206 of the Flood Control Act of 1958 and resolutions adopted by Congress in 1971, the Corps was involved in studying alternative wastewater management systems for the Chicago-south end of Lake Michigan (C-SELM) area, which covered portions of northeastern Illinois and northwestern Indiana. Specifically, the study was directed at the evaluation of various regional wastewater management systems, including plans which would result in the elimination of pollution discharges. An initial pilot study was completed in 1974. However, since this was only a planning study, the report contained no recommendations for federal action with respect to any of the specific wastewater management systems evaluated. The intent of Congress was for these studies to be presented to local units of government for their consideration. Given the widespread public opposition to the results of the study, the possibility at it being implemented must be regarded as remote.

3. Dredge and Fill Permits

   Under Section 404 of PL 92-500, the Corps is authorized to issue permits for the placement of dredged or fill material into navigable waters or on adjacent land sites. Permits may be withheld if it is determined that the discharge will have adverse effects on water supplies, fish and wildlife, or recreation. Under current guidelines, Corps authority extends to all navigable waters and tributaries where the average annual flow is 5 cfs or more. Thus, the entire Fox River and many of its tributaries are subject to this permit system.

4. Flood Control

   The Corps has been involved in several studies relating to flood control in the Fox basin. More recently, interest has expanded to include comprehensive studies of other water resources problems. Pursuant to a U.S. House of Representatives resolution adopted April 11, 1974, the Corps has been involved in the preparation of a report to determine the feasibility of developing a comprehensive water resources plan for the basin, including flood control, water supply, recreation, fish and wildlife management, and aesthetic enhancement. The study area includes the entire basin, including that portion in Wisconsin. Work is to be completed in 1983, at which time, select projects will be recommended for implementation.

U.S. Department of Agriculture

The Agricultural Stabilization and Conservation Service (ASCS) and the Soil Conservation Service (SCS) are the two principal units of the U.S. Department of Agriculture with programs related to water quality management.

1. Conservation Program

The SCS and ASCS provide a variety of services directed at the reduction of soil erosion. The SCS offers technical assistance to individuals, local soil and water conservation districts, and other interested parties in developing erosion control plans. The ASCS gives assistance through cost-sharing to farmers to control erosion and related water pollution problems.

2. PL-566 Projects

The small watershed program of the SCS, authorized by the watershed Protection and Flood Prevention Act of 1954 (PL 83-566), provides a framework through which federal, state, and local units of government can deal with local water resources problems on a cooperative basis. The program is principally oriented toward the prevention of soil erosion and the control of flooding and sedimentation damages. Works typically include the construction of small reservoirs, stream channelization, grade stabilization, and bank protection. Projects are sponsored by and coordinated through local soil and water conservation districts and other interested agencies.

No PL-566 projects are currently proposed for the Fox River or its tributaries.

3. Chicago Area River Basin Study

In 1971, a Chicago area river basin study was initiated by the SCS under PL-566. Work was undertaken in six watersheds in Cook and Lake Counties to develop comprehensive plans to reduce floodwater damage.

Poplar Creek, a tributary to the Fox River was included in the study, and in 1975, a floodwater management plan was completed calling for construction of .27 miles of earth dike and replacement of an existing highway bridge near Elgin. Other recommended measures included an accelerated program to control soil erosion, the purchase of certain flood plain properties and wetlands for open space preservation, flood plain regulation, and channel maintenance.

As a water quality benefit, the SCS estimates that implementation of the plan would reduce the amount of sediment entering the creek to 28,100 tons per year. Thus far, implementation has centered on construction of the dike.

Illinois Department of Transportation

Two divisions of this department have responsibilities for water quality management: the Division of Water Resources (IDWR) and the Division of Highways.

1. IDWR

IDWR has statutory responsibility for navigation and flood control projects on water bodies throughout the state. It also has permit authority for private and public projects which enter or cross over or under such waters. The division also operates the McHenry Lock and Dam, which is used to control upstream water levels in the Chain of Lakes.

The IDWR also has underway a number of flood control projects in the region. However, the Poplar Creek dike (noted previously) is the only flood control project currently proposed for the Fox River basin.

2. Division of Highways

The Division of Highways is responsible for the construction and maintenance of state highways. Highways have associated water quality impacts both during their construction (e.g. erosion and sedimentation, disruption of drainage, etc.) as well as when placed in use (e.g., road salt usage, roadway drainage). Current long range plans call for the construction of a multi-lane, Fox River valley freeway, which would generally parallel the river, and the Richmond-Waukegan freeway which would cross the river north of McHenry.

SEWRPC

The Southeastern Wisconsin Regional Planning Commission (SEWRPC) is the regional planning agency for seven counties in southeastern Wisconsin. SEWRPC has recently completed a 208 water quality management plan for its jurisdictional area. NIPC and SEWRPC have coordinated their respective planning efforts because of a common interest in Lake Michigan, the Des Plaines River, the Fox River, and tributaries to the Kishwaukee River. Emphasis has been placed on the development of plans for the Wisconsin portion of shared basins which will allow the more stringent Illinois water quality standards to be met.

Local Units of Government

Municipalities, several counties, and a number of special purpose districts are involved in a number of projects which have direct or indirect water quality impacts. The general purpose units are empowered to adopt regulations, such as flood plain ordinances, on-site stormwater detention ordinances, and soil erosion and sedimentation control ordinances. All of these have the potential for improving water quality. Zoning ordiances, building codes, and health regulations all have the potential for at least peripheral impact on local water quality. Still other effects result from routine activities, such as street sweeping, sewer and catch basin cleaning, and solid waste management. Building permits which involve stormwater drainage systems which discharge into local streams can have important water quality implications.

Special purpose districts also are involved. The Elgin and Aurora Sanitary Districts, as well as the MSDGC, have constructed extensive wastewater facilities in the basin. The Cook County Forest Preserve District has been active in acquiring land in its portion of the basin and preserving it in a natural state. Most other large blocks of public open land in the basin are held by the Illinois Department of Conservation. Local soil and water conservation districts have been active in promoting soil erosion control measures.

Another organization is the Chain-of-Lakes-Fox River Commission which has been focusing attention on the flooding, water quality, and recreational problems of the upper portion of the basin. The commission has attempted to better define problems and their causes and has conducted some remedial work, including limited dredging of connecting channels in the Chain-of-Lakes.

19.03 WATER QUALITY IN THE BASIN

a. Applicable State Standards and Classification

All waterways in the basin are designated as "general use, protected for public and food processing water supply" and are subject to state standards for waterways with such designation. A full discussion of general use standards and other standards applicable to water quality is given in Chapter Five.

The state has been divided by the Illinois Environmental Protection Agency (IEPA) into hydrologic units that coincide with major river basins. These units have been further divided into segments on the basis of common characteristics. The Fox River basin is nearly identical to the four segments in the Fox River hydrologic unit delineated by the IEPA. These segments, like all others in the state, have been designated "water quality limited."

This designation means that water quality in the Fox River basin will be below state standards even when minimal effluent standards are being met in all wastewater discharges.

b. Sources of Water Quality Information

Assessment of current water quality conditions of the Fox River and its tributaries has been based on information developed from water quality sampling and analysis programs undertaken by this Commission and several other public agencies, principally the IEPA. Information obtained by NIPC from computer simulation of existing conditions using the Hydrocomp water quality model was also used to evaluate current water quality in the Fox River basin.

Sampling and Analysis

The water quality sampling and analysis programs conducted by the Commission included 48 in-stream sampling stations. (See Chapter Five). Seven of these stations were within the Fox River basin. The IEPA sampling program is a continuing effort at 178 stations of which 33 are in the Fox basin.

In addition to the in-stream sampling program, NIPC conducted several other sampling programs including the following:

- Land use runoff sampling and analysis at 16 sites and two Lake Michigan Ravines;
- Sediment oxygen demand (SOD) measurements at 110 stations;
- Benthic macroinvertebrate sampling at 116 stations;
- Dam aeration/deaeration measurement at 48 structures; and
- Fish population surveys at 60 sites.

Sampling stations are shown in Figure 19-3.

Computer Simulation of Existing Conditions

As shown in Figure 19-4, the basin has been divided into 49 areas called reaches. Measurements of water quality data were reported at 13 of these reaches, which summarized the water quality conditions of the entire 49. It is possible to assemble a complete picture of the basin in this manner because data collected at a given point reflect conditions throughout the entire drainage basin upstream of that point. Table 19-8 describes each of the 13 summary reaches.

The concept of reaches is an important one in this areawide planning program. Water quality research done by the Commission was conducted in the basin on a reach-by-reach basis. Reports of simulated existing and future conditions are prepared with the model, and presented, on a reach-by-reach basis. The data, in each case, represent simulated conditions at the "data output points" shown in Figure 19-4.

TABLE 19-8: SUMMARY REACHES IN THE FOX RIVER BASIN

Reach 31 -- data collection point: Nippersink Creek, at Thompson Road just upstream from Wonder Lake,

Reach 106 -- data collection point: Nippersink Creek, where it flows into Nippersink Lake,

Reach 113 -- data collection point: Grass Lake outlet above Nippersink Lake,

Reach 117 -- data collection point: Sqaw Creek outlet into Fox Lake,

Reach 121 -- data collection point: the Fox River at Johnsburg,

Reach 270 -- data collection point: Flint Creek where it flows into the Fox River in Cuba Township, Cook County,

Reach 300 -- data collection point: Spring Creek where it flows into the Fox River at Cary,

Reach 310 -- data collection point: the Fox River at Algonquin,

Reach 340 -- data collection point: Tyler Creek where it flows into the Fox River on the north edge of Elgin.

Reach 360 -- data collection point: Poplar Creek where it flows into the Fox River from the east at Elgin,

Reach 370 -- data collection point: the Fox River at Valley View,

Reach 430 -- data collection point: Otter Creek where it flows into the Fox River north of St. Charles,

Reach 480 -- data collection point: the Fox River at Montgomery dam.

Figure 19-2: WATER SAMPLING STATIONS

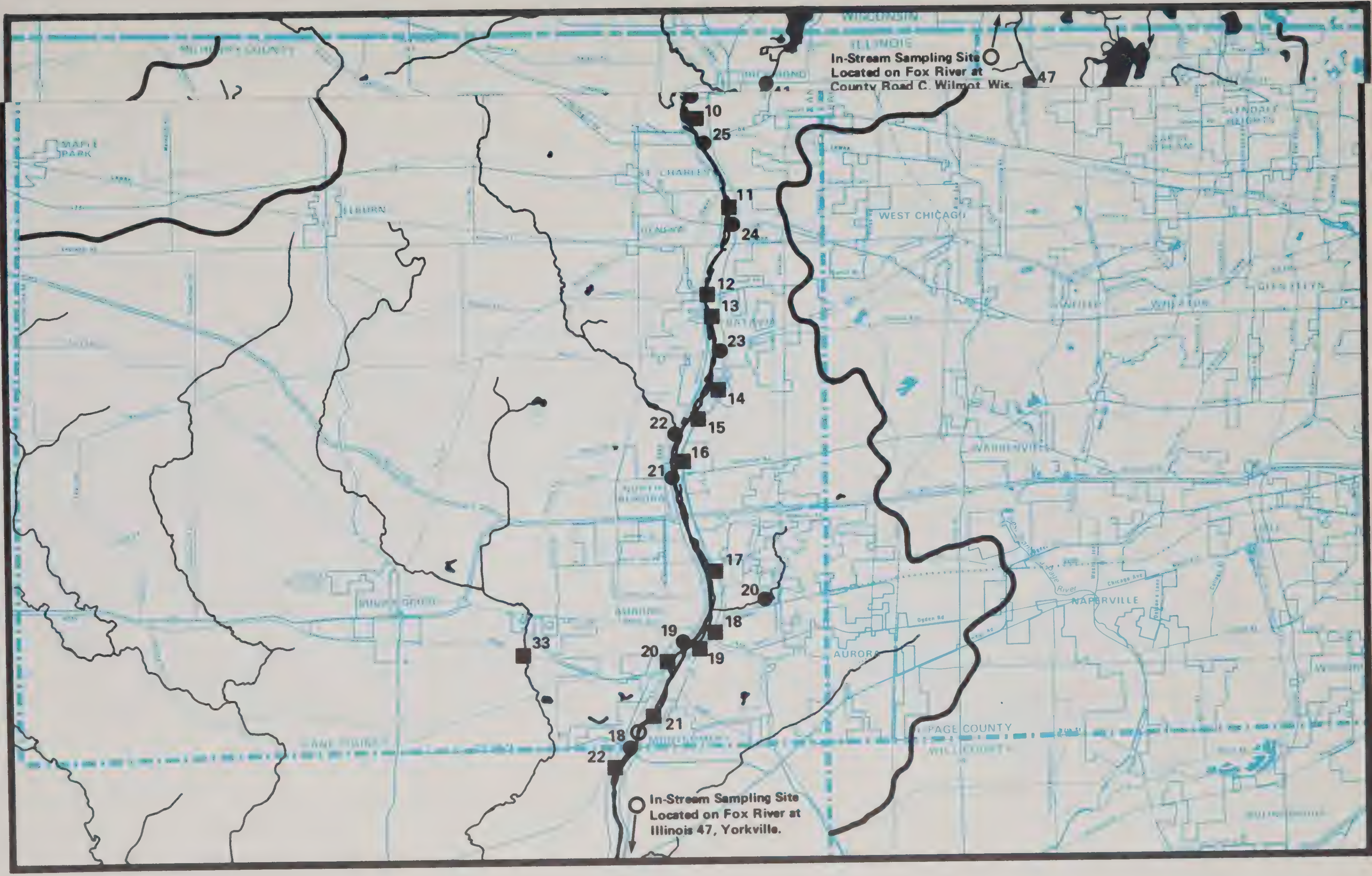


Figure 19-2: WATER SAMPLING STATIONS

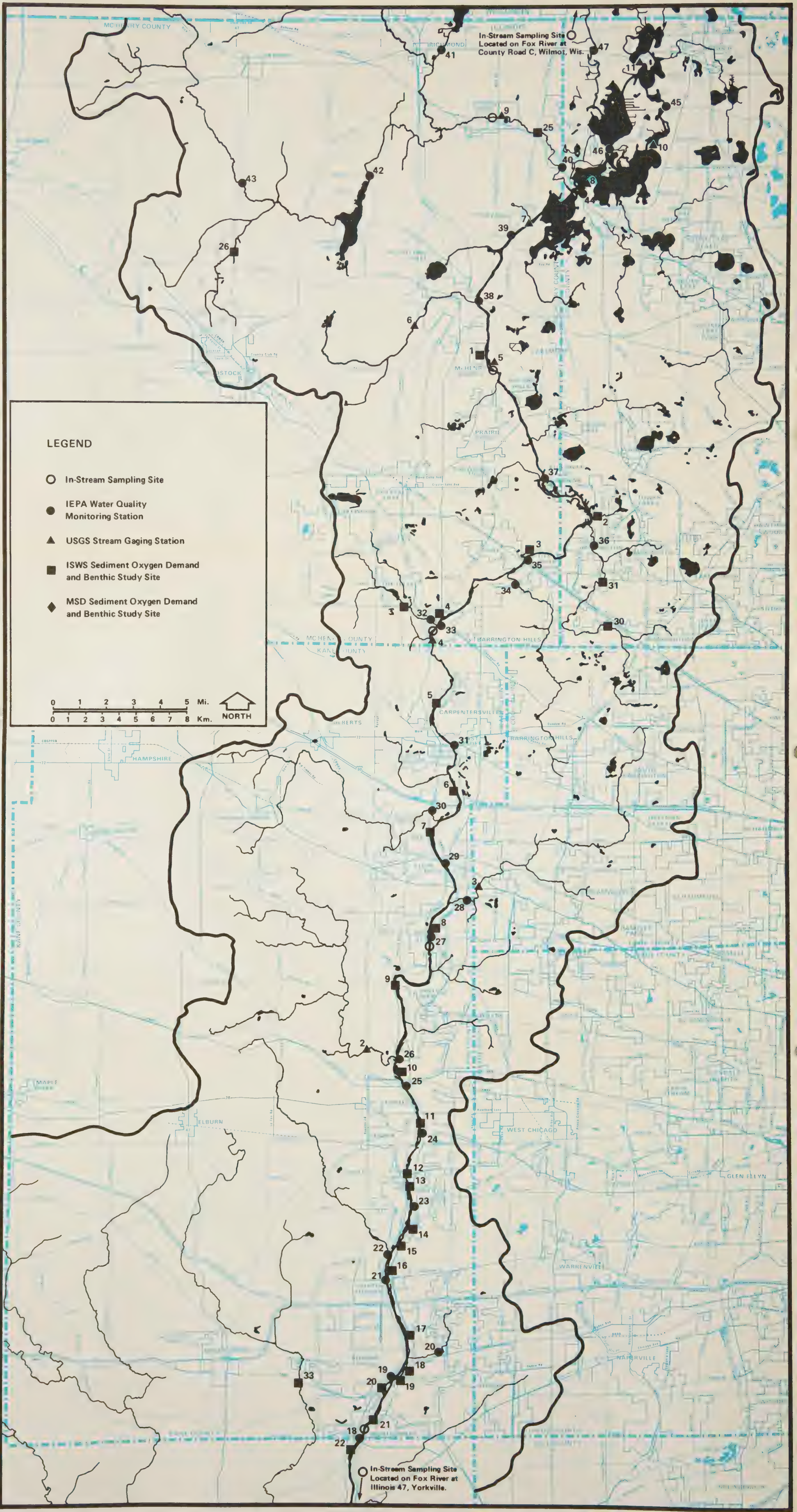

In-Stream Sampling Site Located on Fox River at County Road C, Wilmot, Wis.
LEGEND
○ In-Stream Sampling Site
● IEPA Water Quality Monitoring Station
▲ USGS Stream Gaging Station
■ ISWS Sediment Oxygen Demand and Benthic Study Site
◆ MSD Sediment Oxygen Demand and Benthic Study Site
0 1 2 3 4 5 Mi.
0 1 2 3 4 5 6 7 8 Km.
NORTH
McHENRY COUNTY
RICHMOND
McHENRY
PRAIRIE
BARRINGTON HILLS
CARPENTERSVILLE
HAMPSHIRE
ELBURN
WEST CHICAGO
GLEN ELLYN
WARRENVILLE
NAPERVILLE
MAPLE
McHENRY COUNTY
KANE COUNTY
In-Stream Sampling Site Located on Fox River at Illinois 47, Yorkville.

Figure 19-3: BASIN MODELING SEGMENTS

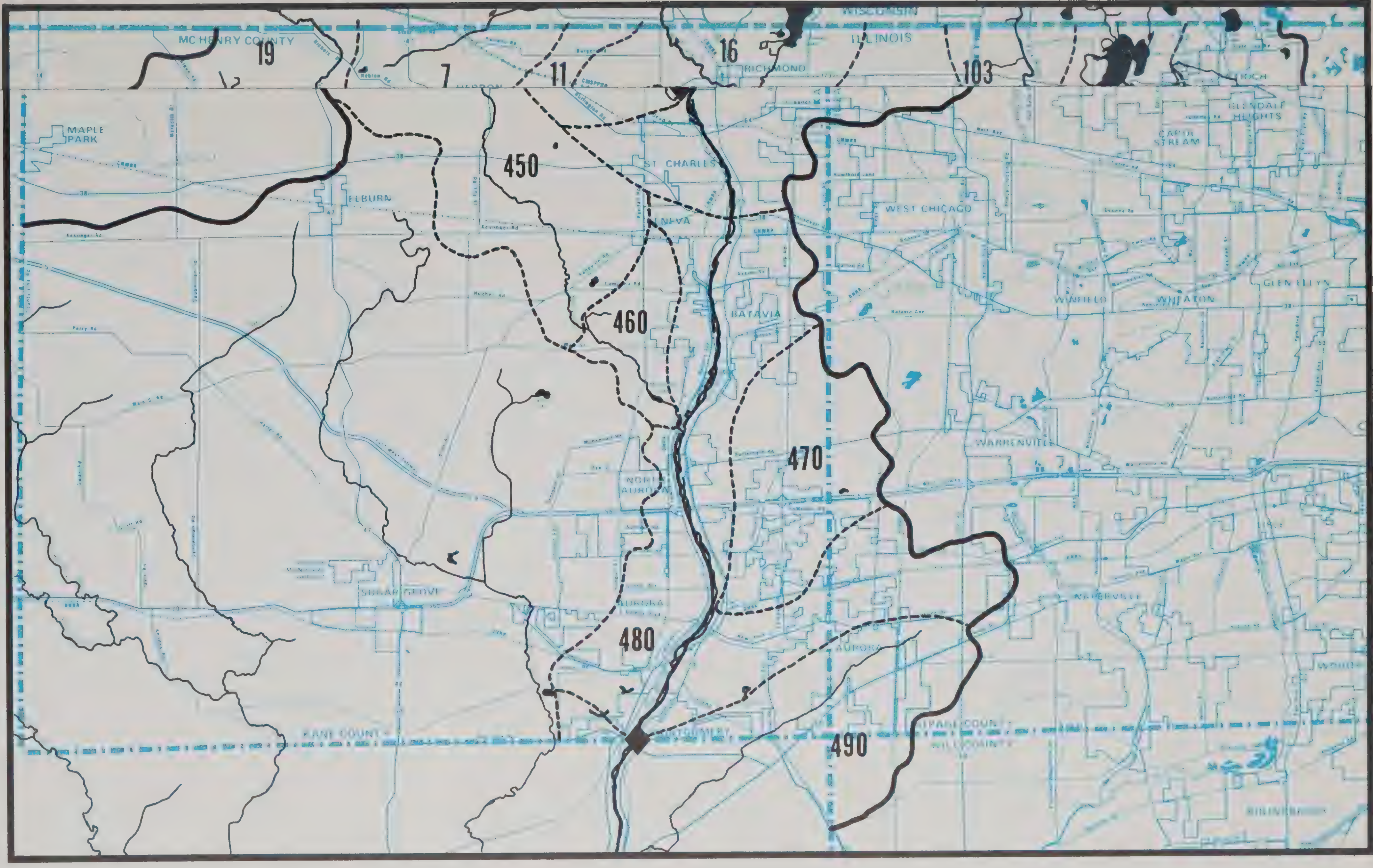
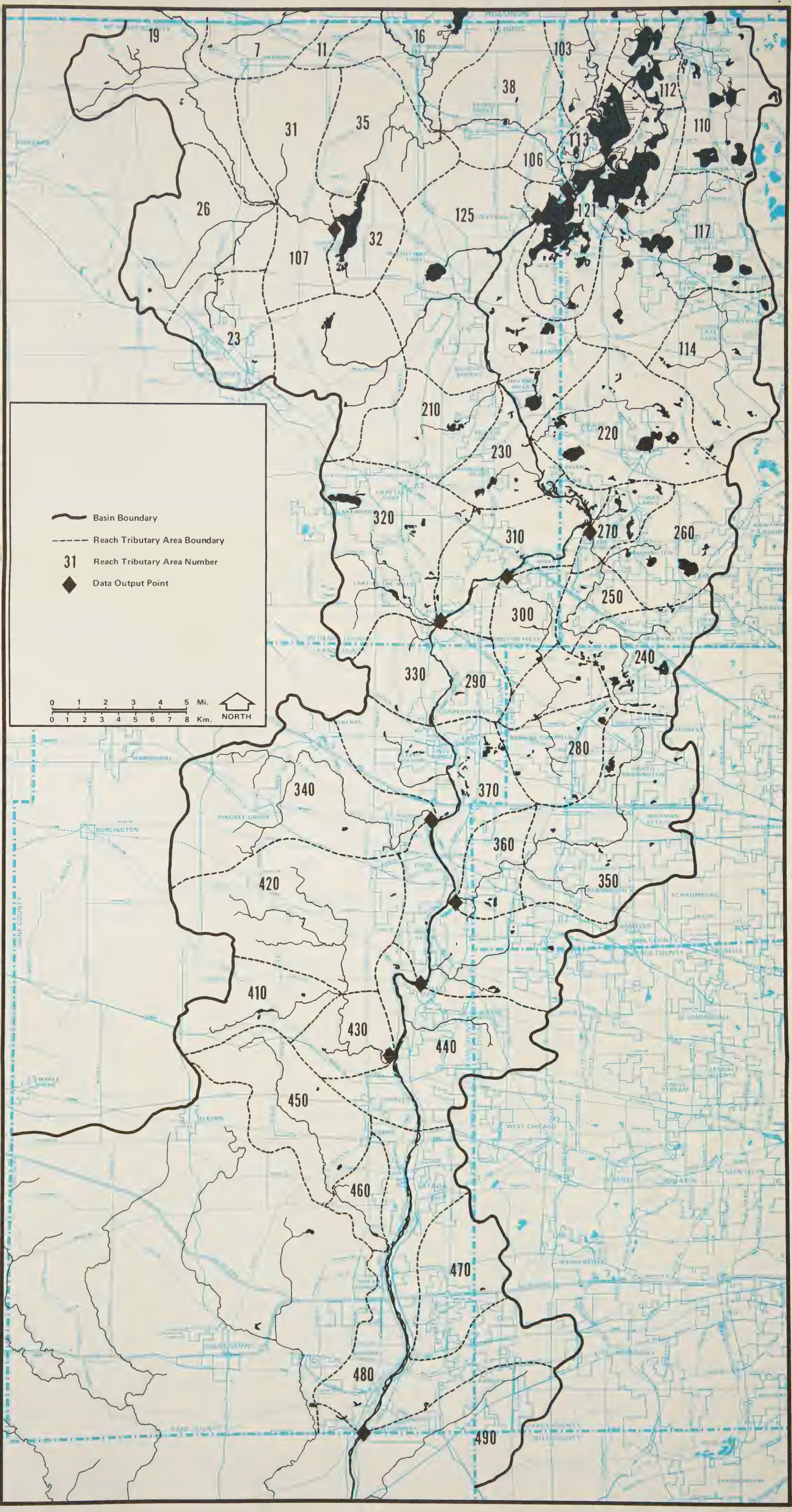


Figure 19-3: BASIN MODELING SEGMENTS



As described in Chapter Three, the Hydrocomp water quality model is a computerized system that uses mathematical formulas to replicate the drainage basin of the Fox River. This process of using a computerized system to replicate conditions in a physical system is called simulation.

To insure that the model really is an accurate representation of the real Fox basin, the behavior of the model has been compared to measurements of actual conditions in the basin. For example, the model's description of existing water quality in the basin has been compared to actual water samples collected and analyzed in the basin during 1976 and 1977.

Sources of pollutants are categorized in the modeling process as follows:

- Point sources: treatment plants and other discrete dischargers;
- Nonpoint sources: surface runoff and groundwater seepage from developed and undeveloped areas;
- Combined sewer overflows; and
- Boundary conditions: the amount of pollution flowing into a basin from another basin or another state. The Fox River originates in Wisconsin before entering Illinois, and boundary conditions are a major source of pollutants to the Illinois portions of the basin.

c. Description of Current Water Quality

Results of Sampling and Analysis

1. In-stream Sampling (208)

Seven in-stream sampling stations were located in the Fox River basin at the following locations:

Station 1: Fox River at County Road C in Wilmot, Wisconsin;
Station 2: Nippersink Creek at Winn Road in Spring Grove;
Station 3: Fox River at McHenry Dam;
Station 5: Fox River at Illinois 62 in Algonquin;
Station 6: Fox River at State Street in South Elgin;
Station 7: Fox River at Montgomery Road in Montgomery;
Station 8: Fox River at Illinois 47 in Yorkville.

Data were collected seasonally over a 13-month period (April, 1976 through April, 1977) at each station primarily for use in calibrating the water quality simulation model. Results are shown in Table 19-9. Samples were analyzed for 19 constituents or characteristics, and stream flow was measured at the time of sample collections. Of the 19 parameters

TABLE 19-9 IN-STREAM WATER QUALITY ANALYSES – SUMMARY DATA

FOX RIVER BASIN

STATION NO. 1

SAMPLING PERIOD	STATISTICS	PARAMETERS[1]																			
		ph (units)	Alkalinity	Turbidity (JTU)	Total Suspended Solids	Total Solids	Volatile Suspended Solids	Temperature (°C)	Dissolved Oxygen	BOD$_5$[2]	BOD$_{20}$[2]	Chemical Oxygen Demand[3]	Total Organic Carbon[3]	Total Kjeldahl Nitrogen	Ammonia Nitrogen	Nitrite-Nitrate Nitrogen	Soluble Phosphorus	Silica	Hardness	Chlorophyll a (µg/l)	Flow (cfs)
APRIL 5 - 14 1976	No. of Analyses	30	11	30	30	30	30	30	30	10	10			30	30	30	30	10	2	10	
	Maximum	8.9	257	36	141	612	27	14	15	12	19			2.4	0.4	1.9	0.29	6	350	106	1280.0
	Minimum	7.7	216	14	32	444	5	4	10	2	5			0.5	0.0	1.0	0.05	2	337	39	636.0
	Mean	8.2	234	20	55	504	13	8	12	5	10			1.5	0.2	1.4	0.11	4	344	66	
JULY 5 - 15 1976	No. of Analyses	30	10	30	30	30	30	30	30	10	10			30	30	30	30	10	2	10	
	Maximum	8.8	212	41	93	738	34	30	19	11	18			2.3	0.3	0.0	0.26	4	286	248	
	Minimum	6.5	184	21	38	458	9	24	7	4	11			1.4	0.0	0.0	0.06	1	269	81	
	Mean	8.1	201	29	69	511	24	27	12	8	15			1.8	0.1	0.0	0.14	1	278	182	
OCTOBER 4 - 13 1976	No. of Analyses	30	10	30	30	30	30	30	30	10	10			30	30	30	30	10	2	10	
	Maximum	8.8	406	28	74	526	19	19	18	6	14			2.3	0.1	2.7	0.17	6	322	189	
	Minimum	7.9	175	10	18	424	6	11	8	3	7			0.4	0.1	0.1	0.06	2	311	74	
	Mean	8.4	224	17	42	473	13	14	13	5	10			1.4	0.1	0.4	0.09	4	317	125	
JANUARY 4 - 11 1977	No. of Analyses	0	0	0	0	0	0	0	0	0	0			0	0	0	0	0	0	0	
	Maximum																				
	Minimum																				
	Mean																				
APRIL 4 - 9 1977	No. of Analyses	10	6	10	10	10	10	10	10	6	6			10	10	10	10	6	2	6	
	Maximum	8.1	216	15	68	590	15	9	13	5	10			1.7	0.1	3.2	0.08	8	397	74	
	Minimum	7.3	203	7	20	464	8	5	10	1	5			1.0	0.1	2.5	0.02	7	370	52	
	Mean	7.7	208	10	34	516	11	7	12	4	8			1.2	0.1	2.9	0.05	7	384	62	

STATION NO. 2

APRIL 5 - 14 1976	No. of Analyses	30	11	30	30	30	30	30	29	10	10			30	30	30	30	10	2	10	
	Maximum	8.9	249	30	102	554	19	16	18	10	16			1.9	0.4	2.8	0.32	7	351	90	195.0
	Minimum	8.1	233	12	31	422	10	4	10	3	7			0.2	0.0	0.9	0.05	3	335	66	110.0
	Mean	8.3	240	19	57	474	14	8	12	5	10			1.1	0.2	2.2	0.11	5	343	77	
JULY 5 - 15 1976	No. of Analyses	30	10	30	30	30	30	30	30	10	10			30	30	30	30	10	2	10	
	Maximum	8.8	212	41	93	738	34	30	19	11	18			2.3	0.3	0.0	0.26	4	286	248	
	Minimum	6.5	184	21	38	458	9	24	7	4	11			1.4	0.0	0.0	0.06	1	269	81	
	Mean	8.1	201	29	69	511	24	27	12	8	15			1.9	0.1	0.0	0.14	1	278	182	
OCTOBER 4 - 13 1976	No. of Analyses	30	10	30	30	30	30	30	30	10	10			30	30	30	30	10	2	10	
	Maximum	8.8	406	28	74	526	19	19	18	6	14			2.3	0.1	2.7	0.17	6	322	189	
	Minimum	7.9	175	10	18	424	6	11	8	3	7			0.4	0.1	0.1	0.06	2	311	74	
	Mean	8.4	224	17	42	473	13	14	13	5	10			1.4	0.1	0.4	0.09	4	317	125	
JANUARY 4 - 11 1977	No. of Analyses	0	0	0	0	0	0	0	0	0	0			0	0	0	0	0	0	0	
	Maximum																				
	Minimum																				
	Mean																				
APRIL 4 - 9 1977	No. of Analyses	10	6	10	10	10	10	10	10	6	6			10	10	10	10	6	2	6	
	Maximum	8.1	263	16	80	540	16	9	13	6	10			1.5	0.1	3.0	0.07	8	376	86	
	Minimum	7.2	240	8	34	338	10	5	9	3	7			0.8	0.1	2.0	0.03	6	375	63	
	Mean	7.8	248	11	45	492	13	7	11	5	9			1.0	0.1	3.0	0.05	7	376	74	

(1) All units are expressed in milligrams per liter (mg/l) unless otherwise noted

(2) BOD's are inhibited

(3) Analysis by Nalco

TABLE 19-9 IN-STREAM WATER QUALITY ANALYSES – SUMMARY DATA

FOX RIVER BASIN

STATION NO. 3

SAMPLING PERIOD	STATISTICS	PARAMETERS[1]																			
		ph (units)	Alkalinity	Turbidity (JTU)	Total Suspended Solids	Total Solids	Volatile Suspended Solids	Temperature (°C)	Dissolved Oxygen	BOD_5[2]	BOD_{20}[2]	Chemical Oxygen Demand[3]	Total Organic Carbon[3]	Total Kjeldahl Nitrogen	Ammonia Nitrogen	Nitrite-Nitrate Nitrogen	Soluble Phosphorus	Silica	Hardness	Chlorophyll a (µg/l)	Flow (cfs)
APRIL 5 - 14 1976	No. of Analyses	30	11	30	30	30	30	30	30	10	10			30	30	30	30	10	2	10	
	Maximum	9.2	200	53	179	542	31	14	22	11	21			4.0	0.6	1.7	0.50	4	302	245	2040.0
	Minimum	7.8	176	19	46	346	4	4	10	7	7			0.8	0.1	0.4	0.04	1	266	168	720.0
	Mean	8.7	191	27	72	445	21	8	17	9	16			2.4	0.3	0.9	0.10	2	284	203	
JULY 5 - 15 1976	No. of Analyses	30	10	30	30	30	30	30	30	10	10			30	30	30	30	10	2	10	
	Maximum	8.7	254	42	75	550	31	29	13	7	22			2.3	0.1	0.0	0.21	5	302	97	
	Minimum	7.0	207	18	28	452	9	24	7	2	11			1.6	0.0	0.0	0.03	2	298	55	
	Mean	8.3	221	24	43	481	19	26	9	5	14			1.9	0.1	0.0	0.13	3	300	76	
OCTOBER 4 - 13 1976	No. of Analyses	30	10	30	30	30	30	30	30	10	10			30	30	30	30	10	2	10	
	Maximum	8.9	293	28	65	530	29	18	15	9	20			3.1	0.1	0.2	0.12	2	286	143	
	Minimum	7.4	165	13	22	396	9	10	7	4	9			0.8	0.1	0.1	0.07	0	285	70	
	Mean	8.5	207	20	43	444	18	14	12	7	14			1.9	0.1	0.1	0.09	1	286	115	
JANUARY 4 - 11 1977	No. of Analyses	9	6	9	9	9	9	9	9	6	6			9	9	9	9	6	2	6	
	Maximum	8.0	343	7	20	620	11	1	18	6	12			2.5	0.3	1.8	0.12	7	489	89	
	Minimum	7.5	252	3	2	542	1	0	14	2	4			1.3	0.1	1.2	0.04	5	454	63	
	Mean	7.8	306	5	10	588	6	0	16	4	9			1.7	0.2	1.6	0.07	6	472	77	
APRIL 4 - 9 1977	No. of Analyses	10	6	10	10	10	10	10	10	6	6			10	10	10	10	6	2	6	
	Maximum	8.5	202	32	103	518	31	10	19	11	27			2.0	0.1	1.0	0.05	4	284	310	
	Minimum	7.9	173	19	60	388	21	7	10	5	15			1.3	0.1	0.4	0.01	0	283	294	
	Mean	8.3	184	24	81	447	27	8	14	8	21			1.8	0.1	0.8	0.03	2	284	301	

STATION NO. 5

APRIL 5 - 14 1976	No. of Analyses	30	11	30	30	30	30	30	30	10	10			30	30	30	30	10	2	10	
	Maximum	9.0	212	40	127	574	30	14	19	13	23			4.5	0.4	1.9	0.40	3	311	220	2440.0
	Minimum	8.3	169	17	45	400	8	5	11	6	11			1.4	0.0	0.4	0.04	1	271	126	806.0
	Mean	8.6	200	27	78	471	20	9	15	9	16			2.2	0.2	1.1	0.11	2	291	181	
JULY 5 - 15 1976	No. of Analyses	30	10	30	30	30	30	30	30	10	10			30	30	30	30	10	2	10	
	Maximum	8.8	212	41	93	738	34	30	19	11	18			2.3	0.3	0.0	0.26	4	286	248	
	Minimum	6.5	184	21	38	458	9	24	7	4	11			1.4	0.0	0.0	0.06	1	269	81	
	Mean	8.1	201	29	69	511	24	27	12	8	15			1.8	0.1	0.0	0.14	1	278	182	
OCTOBER 4 - 13 1976	No. of Analyses	30	10	30	30	30	30	30	30	10	10			30	30	30	30	10	2	10	
	Maximum	8.9	232	33	102	514	30	19	15	8	20			2.7	0.5	0.7	0.10	2	301	109	
	Minimum	8.1	158	12	27	418	11	10	7	3	7			1.1	0.1	0.1	0.06	0	300	79	
	Mean	8.5	198	21	49	451	17	14	11	6	13			1.9	0.1	0.1	0.08	1	301	96	
JANUARY 4 - 11 1977	No. of Analyses	0	0	0	0	0	0	0	0	0	0			0	0	0	0	0	0	0	
	Maximum																				
	Minimum																				
	Mean																				
APRIL 4 - 9 1977	No. of Analyses	10	6	10	10	10	10	10	10	6	6			10	10	10	10	6	2	6	
	Maximum	8.5	189	26	93	570	35	11	17	12	31			2.2	0.1	0.7	0.07	3	287	397	
	Minimum	8.2	169	16	63	410	22	8	10	5	17			1.5	0.1	0.4	0.02	0	287	300	
	Mean	8.4	179	19	78	474	28	9	15	9	23			1.9	0.1	0.6	0.04	2	287	343	

(1) All units are expressed in milligrams per liter (mg/l) unless otherwise noted

(2) BOD's are inhibited

(3) Analysis by Nalco

TABLE 19-9 IN-STREAM WATER QUALITY ANALYSES – SUMMARY DATA

FOX RIVER BASIN

STATION NO. 6

SAMPLING PERIOD	STATISTICS	PARAMETERS[1]																			
		ph (units)	Alkalinity	Turbidity (JTU)	Total Suspended Solids	Total Solids	Volatile Suspended Solids	Temperature (°C)	Dissolved Oxygen	BOD_5 [2]	BOD_{20} [2]	Chemical Oxygen Demand[3]	Total Organic Carbon[3]	Total Kjeldahl Nitrogen	Ammonia Nitrogen	Nitrite-Nitrate Nitrogen	Soluble Phosphorus	Silica	Hardness	Chlorophyll a (μg/l)	Flow (cfs)
APRIL 5 - 14 1976	No. of Analyses	30	11	30	30	30	30	29	3	10	10			30	30	30	30	10	2	10	
	Maximum	8.9	216	56	261	668	40	13	14	10	18			3.0	0.6	2.1	0.30	4	332	245	2800.0
	Minimum	8.5	188	20	62	404	11	3	10	6	5			1.1	0.1	0.5	0.04	0	270	138	1280.0
	Mean	8.7	205	31	97	500	23	9	12	8	13			2.2	0.3	1.2	0.10	2	301	197	
JULY 5 - 15 1976	No. of Analyses	30	10	30	30	30	30	29	30	10	10			30	30	30	30	10	2	10	
	Maximum	8.7	244	41	132	668	32	29	14	9	21			2.9	0.4	0.7	0.30	2	319	178	
	Minimum	6.4	221	18	30	496	13	24	7	2	10			1.7	0.0	0.2	0.14	1	306	82	
	Mean	8.3	234	26	60	556	21	26	9	6	14			2.2	0.2	0.5	0.21	1	313	144	
OCTOBER 4 - 13 1976	No. of Analyses	30	10	30	30	30	30	30	30	10	10			30	30	30	30	10	2	10	
	Maximum	8.7	237	26	67	566	19	19	14	12	20			2.6	0.6	1.1	0.41	5	333	103	
	Minimum	8.0	199	15	22	444	7	10	8	4	5			1.5	0.1	0.6	0.08	1	316	55	
	Mean	8.3	221	20	43	491	13	14	10	6	11			2.1	0.3	0.9	0.25	2	325	72	
JANUARY 4 - 11 1977	No. of Analyses	10	6	10	10	10	10	10	10	6	6			10	10	10	10	6	2	6	
	Maximum	8.1	326	11	24	642	13	1	14	7	14			3.4	1.3	1.8	0.50	7	464	99	
	Minimum	7.7	305	4	10	588	1	0	10	2	11			2.0	0.8	1.4	0.14	4	445	82	
	Mean	7.9	316	7	15	618	9	0	13	5	13			2.5	1.1	1.5	0.33	6	455	90	
APRIL 4 - 9 1977	No. of Analyses	10	6	10	10	10	10	10	10	6	6			10	10	10	10	6	2	6	
	Maximum	8.7	189	25	118	592	39	11	14	13	29			2.5	0.1	0.7	0.07	3	302	376	
	Minimum	8.2	159	15	68	446	25	8	9	3	21			2.0	0.1	0.5	0.02	0	274	329	
	Mean	8.4	177	19	82	498	30	9	12	9	24			2.2	0.1	0.6	0.03	1	288	351	

STATION NO. 7

APRIL 5 - 14 1976	No. of Analyses	30	11	30	30	30	30	30	30	10	10			30	30	30	30	10	2	10	
	Maximum	9.0	217	37	123	556	29	14	13	10	21			2.8	0.6	2.2	0.60	4	320	243	3400.0
	Minimum	8.4	178	24	45	288	5	4	2	6	6			1.2	0.0	0.5	0.05	0	274	134	1120.0
	Mean	8.6	203	32	96	496	23	9	11	8	14			2.1	0.3	1.3	0.12	2	297	185	
JULY 5 - 15 1976	No. of Analyses	30	10	30	30	30	30	29	30	10	10			30	30	30	30	10	2	10	
	Maximum	8.7	231	33	97	654	31	30	14	12	21			3.1	0.3	0.3	0.33	1	313	190	
	Minimum	6.4	205	17	24	324	14	24	3	4	11			1.6	0.0	0.0	0.14	0	284	119	
	Mean	8.4	216	23	54	534	22	26	8	7	14			2.2	0.1	0.1	0.22	1	299	160	
OCTOBER 4 - 13 1976	No. of Analyses	30	10	30	30	30	30	30	30	10	10			30	30	30	30	10	2	10	
	Maximum	8.5	243	30	76	594	18	19	12	7	12			2.5	0.6	1.3	0.48	5	334	122	
	Minimum	8.0	207	15	23	428	3	10	7	4	8			1.1	0.1	0.8	0.16	1	315	51	
	Mean	8.3	226	19	45	515	12	14	10	5	10			1.8	0.3	1.1	0.30	3	325	85	
JANUARY 4 - 11 1977	No. of Analyses	0	0	0	0	0	0	0	0	0	0			0	0	0	0	0	0	0	
	Maximum																				
	Minimum																				
	Mean																				
APRIL 4 - 9 1977	No. of Analyses	10	6	10	10	10	10	10	9	6	6			10	10	10	10	6	2	6	
	Maximum	8.7	186	23	114	532	49	11	13	14	33			2.8	0.1	1.2	0.10	2	309	389	
	Minimum	8.2	160	16	73	478	26	7	9	6	17			1.0	0.1	0.4	0.02	0	281	338	
	Mean	8.5	176	19	90	509	32	9	11	10	25			2.1	0.1	0.8	0.04	1	295	368	

(1) All units are expressed in milligrams per liter (mg/l) unless otherwise noted

(2) BOD's are inhibited.

(3) Analysis by Nalco

TABLE 19-9 IN-STREAM WATER QUALITY ANALYSES – SUMMARY DATA

FOX RIVER BASIN

STATION NO. 8

SAMPLING PERIOD	STATISTICS	PARAMETERS(1)																			
		ph (units)	Alkalinity	Turbidity (JTU)	Total Suspended Solids	Total Solids	Volatile Suspended Solids	Temperature (°C)	Dissolved Oxygen	BOD$_5$(2)	BOD$_{20}$(2)	Chemical Oxygen Demand(3)	Total Organic Carbon(3)	Total Kjeldahl Nitrogen	Ammonia Nitrogen	Nitrite-Nitrate Nitrogen	Soluble Phosphorus	Silica	Hardness	Chlorophyll a (µg/l)	Flow (cfs)
APRIL 5 - 14 1976	No. of Analyses	30	11	30	30	30	30	30	29	10	10			30	30	30	30	10	2	10	
	Maximum	9.0	226	45	156	616	71	15	17	18	28			3.2	0.7	2.2	0.40	3	311	252	3200.
	Minimum	8.3	191	26	27	324	19	4	23	5	10			1.5	0.1	0.6	0.05	1	285	146	1790.
	Mean	8.6	206	34	104	506	26	10	12	9	17			2.2	0.3	1.4	0.10	2	298	209	
JULY 5 - 15 1976	No. of Analyses	30	10	30	30	30	30	30	30	10	10			30	30	30	30	10	2	10	
	Maximum	8.8	212	41	93	738	34	30	19	11	18			2.3	0.3	0.0	0.30	4	286	248	
	Minimum	6.5	184	21	38	458	9	24	7	4	11			1.4	0.0	0.0	0.06	1	269	81	
	Mean	8.1	201	29	69	511	24	27	12	8	15			1.8	0.1	0.0	0.14	1	278	182	
OCTOBER 4 - 13 1976	No. of Analyses	30	10	30	30	30	30	30	30	10	10			30	30	30	30	10	2	10	
	Maximum	8.7	245	27	70	1030	20	20	12	10	18			3.5	0.4	1.5	0.60	5	345	117	
	Minimum	8.0	217	11	23	486	5	10	3	4	4			0.8	0.1	1.1	0.20	0	317	56	
	Mean	8.4	230	16	38	544	11	14	10	5	10			1.6	0.2	1.3	0.40	3	331	86	
JANUARY 4 - 11 1977	No. of Analyses	10	6	10	10	10	10	10	9	6	6			10	10	10	10	6	2	6	
	Maximum	8.0	330	7	15	664	9	2	13	6	12			3.0	1.8	1.9	0.52	7	463	55	
	Minimum	7.4	306	2	2	596	1	0	10	2	8			2.2	1.1	1.6	0.42	4	449	39	
	Mean	7.9	318	5	9	632	5	0	12	4	10			2.6	1.4	1.8	0.48	5	456	48	
APRIL 4 - 9 1977	No. of Analyses	10	6	10	10	10	10	10	10	6	6			10	10	10	10	6	2	6	
	Maximum	9.1	195	25	113	572	45	13	15	15	37			2.5	0.1	1.2	0.10	1	297	452	
	Minimum	8.2	164	15	69	484	23	6	9	3	14			1.3	0.1	0.4	0.02	0	274	347	
	Mean	8.5	180	19	85	515	31	9	11	11	24			2.1	0.1	0.9	0.05	1	286	373	

STATION NO. ______

	No. of Analyses																				
	Maximum																				
	Minimum																				
	Mean																				
	No. of Analyses																				
	Maximum																				
	Minimum																				
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	Mean																				
	No. of Analyses																				
	Maximum																				
	Minimum																				
	Mean																				

(1) All units are expressed in milligrams per liter (mg/l) unless otherwise noted

(2) BOD's are inhibited

(3) Analysis by Nalco

evaluated, the State of Illinois has established standards for four: pH, temperature, dissolved oxygen (DO), and ammonia. In general, samples obtained were in compliance with these state standards. However, stations above the Chain-of-Lakes, reflecting Reach 106 and inputs from Wisconsin, did show violations of the phosphorous limitation of .05 mg/l. The only other violation of stream standards were low DO readings at Station 7 during July.

2. In-stream Sampling (IEPA)

Thirty-three IEPA in-stream sampling stations are located in the Fox basin. The results of samples taken from these stations during 1976 are shown in Table 19-10. Overall, only one percent of the samples showed violations of the ammonia/nitrogen standard, and one percent showed violations of the DO standard. Violations of the fecal coliform and copper standards were more frequent, with a few violations of the iron, lead, silver, and pH standards also noted. The DO violations were noted in Reach 121 on the Fox River at the Grass Lake outlet and on Indian Creek in Reach 480. The ammonia violations were obscured in Reach 310 on the outlet of Crystal Lake near Algonquin and on Flint Creek in Reach 270. Fecal coliform and metals violations are scattered throughout the basin.

3. SOD sampling

Thirty of the sites at which SOD was measured are in the Fox basin. The overall purpose of these analyses was to estimate the oxygen demand exerted upon the overlying water by bottom-dwelling (benthic) organisms. Conditions were classified as one of the following: clean, moderately clean, slightly degraded, moderately polluted, polluted, heavily polluted, or sewage sludge-like. Table 19-11 shows the results of this classification process. The benthic condition of most of the basin is slightly degraded to moderately polluted. However, areas of moderate and heavy pollution were noted.

4. Biological Classification

As part of the SOD study, benthic macroinvertebrate communities were analyzed, and mathematical Shannon-Weaver indices reflecting the nature and diversity of these communities were developed according to standard formulae. Indices above 3.0 are generally indicative of clean water; values between 1.0 and 3.0 are indicative of moderately polluted water; and values below 1.0 are indicative of severe pollution.

There are 36 stations at which biological analyses were made. The results, shown in Table 19-12, indicate moderate to severe pollution throughout the basin.

Samples were also rated under the IEPA's classification system, in which case, the Fox River basin was classified as semi-polluted to polluted.

TABLE 19-10 : VIOLATIONS IN 1976 OF ILLINOIS IN-STREAM WATER QUALITY STANDARDS

FOX RIVER BASIN

MAP STATION NUMBER	STREAM NAME	STATISTICS	PARAMETERS AND STANDARDS[1]																		
IEPA CODE NUMBER			Ammonia Nitrogen 1.5	Fecal[2] Coliform (per 100 ml.) 200	Iron 1.0	Copper 0.02	Dissolved Oxygen 5.0	Lead 0.10	Silver 0.005	Chloride (4)	Fluoride (4)	PH (Units) 6.5-9	Boron (4)	Sulfate (4)	Cyanide (4)	Hexavalent Chromium (4)	Total Phosphorus (4)	Manganese (4)	Phenol (4)	Total Dissolved Solids (4)	Temp (°F) (4)
15	Fox River	No of Analyses	8	8	4	4	7	4	4			8									
		No of Violations	0	3	1	3	0	1	1			0									
		Maximum		2800	1.3	0.31		0.66	0.090												
DT 11		Minimum		100	0.1	0.02		0.00	0.000												
		Mean[3]		246	0.5	0.11		0.24	0.022												
17	Fox River	No of Analyses	8	8	3	3	8	3	3			8									
		No of Violations	0	5	1	2	0	1	1			1									
		Maximum		4400	1.1	0.32		0.80	0.120			9.2									
DT 03		Minimum		100	0.2	0.00		0.01	0.000			8.3									
		Mean[3]		498	0.5	0.12		0.27	0.040			8.5									
18	Fox River	No of Analyses	9	9	3	3	9	3	3			9									
		No of Violations	0	7	0	3	0	1	0			0									
		Maximum		4800		0.12		0.26													
DT 38		Minimum		100		0.03		0.00													
		Mean[3]		837		0.06		0.10													
19	Fox River	No of Analyses	8	7	3	3	8	3	3			8									
		No of Violations	0	4	1	1	0	0	0			0									
		Maximum		1600	1.2	0.05															
DT 13		Minimum		100	0.2	0.00															
		Mean[3]		384	0.6	0.02															
21	Fox River	No of Analyses	9	9	3	3	9	3	3			9									
		No of Violations	0	1	0	3	0	1	0			0									
		Maximum		900		0.64		0.51													
DT 15		Minimum		100		0.04		0.00													
		Mean[3]		137		0.25		0.18													
23	Fox River	No of Analyses	9	9	2	2	9	2	2			9									
		No of Violations	0	1	0	2	0	1	0			0									
		Maximum		400		0.07		0.36													
DT 04		Minimum		100		0.06		0.02													
		Mean[3]		116		0.06		0.19													
24	Fox River	No of Analyses	9	9	3	3	9	3	3			9									
		No of Violations	0	1	0	2	0	1	0			0									
		Maximum		400		0.12		0.49													
DT 16		Minimum		100		0.02		0.00													
		Mean[3]		116		0.06		0.17													
25	Fox River	No of Analyses	9	9	3	3	8	3	3			9									
		No of Violations	0	1	0	1	0	0	1			0									
		Maximum		300		0.03			0.020												
DT 17		Minimum		100		0.00			0.000												
		Mean[3]		131		0.01			0.007												
27	Fox River	No of Analyses	7	7	2	2	7	2	2			7									
		No. of Violations	0	3	0	1	0	0	0			0									
		Maximum		2900		0.12															
DT 09		Minimum		100		0.01															
		Mean[3]		238		0.06															

(1) All units are expressed in milligrams per liter (mg/l) unless otherwise noted.

(2) Fecal coliform violations are apparent violations (See narrative)

(3) All mean values are arithmetic except for fecal coliforms, which are geometric

(4) No water quality violations for this parameter were reported

TABLE 19-10 : VIOLATIONS IN 1976 OF ILLINOIS IN-STREAM WATER QUALITY STANDARDS

FOX RIVER BASIN

MAP STATION NUMBER / IEPA CODE NUMBER	STREAM NAME	STATISTICS	PARAMETERS AND STANDARDS[1]																		
			Ammonia Nitrogen 1.5	Fecal[2] Coliform (per 100 ml) 200	Iron 1.0	Copper 0.02	Dissolved Oxygen 5.0	Lead 0.10	Silver 0.005	Chloride (4)	Fluoride (4)	PH (Units) 6.5-9	Boron (4)	Sulfate (4)	Cyanide (4)	Hexavalent Chromium (4)	Total Phosphorus (4)	Manganese (4)	Phenol (4)	Total Dissolved Solids (4)	Temp. (°F) (4)
34	Spring Creek	No of Analyses	8	7	2	2	8	2	2			8									
		No of Violations	0	3	0	0	0	0	0			0									
		Maximum		6100																	
DTH 01		Minimum		100																	
		Mean[3]		312																	
36	Flint Creek	No of Analyses	7	6	2	2	7	2	2			7									
		No of Violations	2	1	0	2	0	0	0			0									
		Maximum	5.80	300		0.03															
DTZS 01		Minimum	0.16	100		0.03															
		Mean[3]	1.52	151		0.03															
40	Nippersink Creek	No of Analyses	6	6	2	2	6	2	2			5									
		No of Violations	0	3	1	1	0	0	0			0									
		Maximum		900	1.1	0.03															
DTK 01		Minimum		100	0.3	0.00															
		Mean[3]		208	0.7	0.01															
42	Nippersink Creek	No of Analyses	7	7	2	2	7	2	2			7									
		No of Violations	0	2	1	2	0	0	0			0									
		Maximum		2500	2.2	0.05															
DTK 02		Minimum		100	0.6	0.04															
		Mean[3]		204	1.4	0.04															
43	Nippersink Creek	No of Analyses	6	6	2	2	6	2	2			6									
		No of Violations	0	3	0	1	0	0	0			0									
		Maximum		2300		0.03															
DTK 03		Minimum		100		0.02															
		Mean[3]		272		0.02															
41	Elizabeth Lake Drain	No of Analyses	7	7	0	0	7	0	0			7									
		No of Violations	0	3			0					0									
		Maximum		1700																	
DTKA 03		Minimum		100																	
		Mean[3]		246																	
		No of Analyses																			
		No of Violations																			
		Maximum																			
		Minimum																			
		Mean[3]																			
		No. of Analyses																			
		No. of Violations																			
		Maximum																			
		Minimum																			
		Mean[3]																			
		No of Analyses																			
		No of Violations																			
		Maximum																			
		Minimum																			
		Mean[3]																			

(1) All units are expressed in milligrams per liter (mg/l) unless otherwise noted.

(2) Fecal coliform violations are apparent violations (See narrative)

(3) All mean values are arithmetic except for fecal coliforms, which are geometric

(4) No water quality violations for this parameter were reported

TABLE 19-10 : VIOLATIONS IN 1976 OF ILLINOIS IN-STREAM WATER QUALITY STANDARDS

Fox River BASIN

MAP STATION NUMBER / IEPA CODE NUMBER	STREAM NAME	STATISTICS	Ammonia Nitrogen	Fecal[2] Coliform (per 100 ml.)	Iron	Copper	Dissolved Oxygen	Lead	Silver	Chloride	Fluoride	PH (Units)	Boron	Sulfate	Cyanide	Hexavalent Chromium	Total Phosphorus	Manganese	Phenol	Total Dissolved Solids	Temp (°F)
			1.5	200	1.0	0.02	5.0	0.10	0.005	(4)	(4)	6.5-9	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)
46	Fox River	No of Analyses	7	7	2	2	7	2	2			6									
		No of Violations	0	0	0	2	1	0	0			0									
		Maximum				0.04	25.9														
DT 43		Minimum				0.03	2.6														
		Mean[3]				0.03	11.7														
47	Fox River	No of Analyses	7	7	2	2	7	2	2			6									
		No of Violations	0	2	0	1	0	0	0			0									
		Maximum		800		0.04															
DT 35		Minimum		100		0.00															
		Mean[3]		173		0.02															
16	Morgan Creek	No of Analyses	8	8	0	0	8	0	0			8									
		No of Violations	0	5			0					0									
		Maximum		1000																	
DTZJ 01		Minimum		50																	
		Mean[3]		251																	
20	Indian Creek	No of Analyses	6	6	2	2	6	2	2			6									
		No of Violations	0	2	0	2	2	1	0			0									
		Maximum		3300		0.06	16.1	0.23													
DTZK 01		Minimum		100		0.05	1.7	0.01													
		Mean[3]		241		0.05	8.7	0.12													
22	Mill Creek North	No of Analyses	7	7	2	2	7	2	2			7									
		No of Violations	0	2	0	2	0	0	0			0									
		Maximum		1500		0.03															
DTZL 01		Minimum		100		0.03															
		Mean[3]		190		0.03															
26	Ferson Creek	No of Analyses	7	8	3	3	8	3	3			7									
		No of Violations	0	0	0	3	0	1	1			0									
		Maximum				0.10		0.47	0.020												
DTF 01		Minimum				0.04		0.01	0.000												
		Mean[3]				0.06		0.16	0.007												
28	Poplar Creek	No of Analyses	7	7	2	2	7	2	2			7									
		No of Violations	0	5	0	2	0	0	0			0									
		Maximum		3000		0.94															
DTG 01		Minimum		200		0.04															
		Mean[3]		681		0.49															
30	Tyler Creek	No of Analyses	7	7	3	3	7	3	3			7									
		No of Violations	0	2	0	3	0	1	1			0									
		Maximum		600		0.08		1.43	0.020												
DTZP 01		Minimum		100		0.03		0.00	0.000												
		Mean[3]		151		0.06		0.48	0.007												
32	Crystal Lake Outlet	No of Analyses	8	7	3	3	8	3	3			8									
		No of Violations	1	1	0	1	0	0	0			0									
		Maximum	2.00	400		0.10															
DTZR 02		Minimum	0.00	100		0.00															
		Mean[3]	0.77	121		0.04															

PARAMETERS AND STANDARDS[1]

(1) All units are expressed in milligrams per liter (mg/l) unless otherwise noted.

(2) Fecal coliform violations are apparent violations (See narrative)

(3) All mean values are arithmetic except for fecal coliforms, which are geometric

(4) No water quality violations for this parameter were reported

TABLE 19-10 : VIOLATIONS IN 1976 OF ILLINOIS IN-STREAM WATER QUALITY STANDARDS

Fox River BASIN

MAP STATION NUMBER / IEPA CODE NUMBER	STREAM NAME	STATISTICS	Ammonia Nitrogen 1.5	Fecal[2] Coliform (per 100 ml.) 200	Iron 1.0	Copper 0.02	Dissolved Oxygen 5.0	Lead 0.10	Silver 0.005	Chloride (4)	Fluoride (4)	PH (Units) 6.5-9	Boron (4)	Sulfate (4)	Cyanide (4)	Hexavalent Chromium (4)	Total Phosphorus (4)	Manganese (4)	Phenol (4)	Total Dissolved Solids (4)	Temp. (°F) (4)
29		No of Analyses	7	7	2	2	7	2	2			7									
	Fox River	No of Violations	0	2	0	1	0	0	0			0									
		Maximum		600		0.07															
DT 18		Minimum		100		0.01															
		Mean[3]		184		0.04															
31	Fox	No of Analyses	7	7	3	3	6	3	3			6									
	River	No of Violations	0	1	0	2	0	0	0			0									
		Maximum		1500		0.08															
DT 05		Minimum		100		0.02															
		Mean[3]		147		0.04															
33		No of Analyses	8	7	3	3	8	3	3			8									
	Fox River	No of Violations	0	0	0	1	0	1	1			0									
		Maximum				0.04		0.19	0.020												
DT 06		Minimum				0.02		0.01	0.000												
		Mean[3]				0.02		0.07	0.007												
35		No of Analyses	7	7	3	3	7	3	3			7									
	Fox River	No of Violations	0	0	0	1	0	0	0			0									
		Maximum				0.06															
DT 21		Minimum				0.00															
		Mean[3]				0.02															
37		No of Analyses	6	5	2	2	6	2	2			6									
	Fox River	No of Violations	0	0	0	2	0	1	0			0									
		Maximum				0.05		0.18													
DT 26		Minimum				0.03		0.00													
		Mean[3]				0.04		0.09													
38		No of Analyses	7	7	3	3	6	3	3			7									
	Fox River	No of Violations	0	1	0	1	0	0	0			0									
		Maximum		300		0.04															
DT 23		Minimum		100		0.00															
		Mean[3]		129		0.01															
39		No of Analyses	6	6	2	2	6	2	2			6									
	Fox River	No of Violations	0	1	0	2	0	0	0			0									
		Maximum		300		0.03															
DT 24		Minimum		100		0.03															
		Mean[3]		120		0.03															
44		No of Analyses	7	7	3	3	7	3	3			6									
	Fox River	No of Violations	0	1	0	0	0	1	0			0									
		Maximum		600				0.23													
DT 42		Minimum		100				0.00													
		Mean[3]		142				0.07													
45		No of Analyses	7	7	3	3	7	3	3			7									
	Fox River	No of Violations	0	0	0	2	0	0	0			0									
		Maximum				0.05															
DT 44		Minimum				0.00															
		Mean[3]				0.02															

PARAMETERS AND STANDARDS[1]

(1) All units are expressed in milligrams per liter (mg/l) unless otherwise noted

(2) Fecal coliform violations are apparent violations (See narrative)

(3) All mean values are arithmetic except for fecal coliforms, which are geometric

(4) No water quality violations for this parameter were reported

TABLE 19-11 : GENERALIZED BENTHIC SEDIMENT CONDITIONS

Fox River BASIN

STATION NUMBER	STREAM NAME	BENTHIC CONDITION*
1	Fox River	Moderately Polluted
2	Fox River	Slightly Degraded
3	Fox River	Slightly Degraded
4	Fox River	Moderately Polluted
5	Fox River	Slightly Degraded
6	Fox River	Polluted
7	Fox River	Moderately Polluted
8	Fox River	Moderately Polluted
9	Fox River	Moderately Polluted
10	Fox River	Moderately Polluted
11	Fox River	Polluted
12	Fox River	Moderately Polluted
13	Fox River	Moderately Polluted
14	Fox River	Moderately Polluted
15	Fox River	Polluted
16	Fox River	Moderately Polluted
17	Fox River	Heavily Polluted
18	Fox River	Slightly Degraded
19	Fox River	Moderately Polluted
20	Fox River	Heavily Polluted
21	Fox River	Polluted
22	Fox River	Polluted
23	Fox River	Moderately Polluted
24	Fox River	Polluted

*Based on SOD value

TABLE 19-11 : GENERALIZED BENTHIC SEDIMENT CONDITIONS

Fox River BASIN

STATION NUMBER	STREAM NAME	BENTHIC CONDITION*
25	Nippersink Creek	Slightly Degraded
26	Silver Creek	Polluted
30	Flint Creek	Clean
31	Flint Creek	Slightly Degraded
32	Woods Creek	Slightly Degraded
33	Blackberry Creek	Slightly Degraded

*Based on SOD value

TABLE 19-12 : BIOLOGICAL STREAM SITE CLASSIFICATIONS

Fox River BASIN

Station Number	Stream Name	IEPA Classification(1)	Shannon-Weaver	
			Index	Classification(2)
1	Fox River	P	1.18	MP
1.5	Fox River	P	0.62	SeP
2	Fox River	P	0.81	SeP
3	Fox River	P	1.22	MP
4	Fox River	P	1.00	MP
5	Fox River	P	0.99	SeP
5.5	Fox River	P	0.78	SeP
6	Fox River	P	0.99	SeP
7	Fox River	SP	0.74	SeP
8	Fox River	SP	1.10	MP
9	Fox River	P	0.61	SeP
9.5	Fox River	SP	0.25	SeP
10	Fox River	P	0.99	SeP
11	Fox River	SP	0.99	SeP
12	Fox River	P	0.96	SeP
13	Fox River	P	0.92	SeP
14	Fox River	P	0.66	SeP
15	Fox River	SP	1.65	MP
15 a	Fox River	SP	2.41	MP
16	Fox River	P	0.31	SeP
17	Fox River	SP	0.83	SeP
17.5	Fox River	SP	1.09	MP
18	Fox River	SP	0.38	SeP
19	Fox River	P	0.16	SeP
20	Fox River	SP	1.99	MP

(1) Polluted (P); Semi-polluted (SP); Unbalanced (U); Balanced (B).

(2) Severe pollution (Se P); Moderately polluted (MP); Clean (C).

TABLE 19-12 : BIOLOGICAL STREAM SITE CLASSIFICATIONS

Fox River BASIN

Station Number	Stream Name	IEPA Classification(1)	Shannon-Weaver	
			Index	Classification(2)
21	Fox River	P	0.00	SeP
22	Fox River	SP	0.25	SeP
22.5	Fox River	SP	2.70	MP
23	Fox River	P	0.00	SeP
24	Fox River	P	0.46	SeP
25	Nippersink Creek	SP	1.17	MP
26	Silver Creek	P	0.97	SeP
30	Flint Creek	SP	1.61	MP
31	Flint Creek	SP	1.11	MP
32	Woods Creek	P	0.36	SeP
33	Blackberry Creek	P	0.59	SeP

(1) Polluted (P); Semi-polluted (SP); Unbalanced (U); Balanced (B).

(2) Severe pollution (Se P); Moderately polluted (MP); Clean (C).

5. Fish Species and Habitat

Results of fish sampling indicate that the majority of the Fox River can be classified as good to high quality aquatic habitat. Main river channels usually have the greatest opportunity to undergo degradation. Yet, in the Fox River, good water quality and a diverse fish population are maintained. Many of the tributaries apparently have undergone little modification from their original condition, and a number of fish species, rate elsewhere in northeastern Illinois, were collected from these areas. Slight degradation of the fish assemblage was observed throughout a few tributaries and at the confluence of some tributaries with the river. These degraded areas corresponded to regions undergoing urban development. Silver was the only significant pollutant found in the watershed during these analyses and it was detected only once at each of the six sites. Increased monitoring is needed to better explain the extent of silver contamination in the watershed.

6. Dam Aeration-Deaeration

Dam aeration-deaeration studies for the 14 dams on the Fox River yielded the following results. The dams on the Fox River has created pools immediately above the dam structure. Algal blooms occur in the pools because of the nutrient enriched state of the river. Algal photosynthesis produces supersatured DO concentrations in these pools. As water from these pools passes over the dam crest, oxygen is released, resulting in a deaeration or lower of the DO concentration of the water. Because this DO may be needed downstream as a reserve for algal respiration, low DO events downstream may be experienced. Measurements of DO concentrations above and below dams on the Fox confirmed the deaeration phenomenon. This, coupled with the creation of algal blooms and the reduction in the river's ability to assimilate wastes, form the basis for the conclusion that the dams on the Fox River have a harmful effect on water quality.

7. Land Use Runoff

One land use runoff sampling site (general agriculture) was located in the Fox basin on Big Rock Creek at Perry Road in southwestern Kane County. The results of sampling at that station are more fully discussed in part "e" of this section and in Chapter Six.

d. Results of Water Quality Modeling

The simulation of existing conditions provides a more comprehensive picture of water quality in the basin than do the results of sampling programs. Not only are pollutant concentrations determined and related to state standards, the relative amounts of pollutants contributed by various sources are described.

Pollutant Concentrations

The Commission sampled for 19 pollutant parameters, and simulation reports on existing conditions were prepared for eight parameters: streamflow, temperature, chlorophyll a, dissolved oxygen, biochemical oxygen demand, ammonia (NH_3), nitrate (NO_3), and phosphate (PO_4). The last four of these represent pollutants that can be quantified and tied to specific categories of sources using the model. Sampling for the other 11 pollutant parameters provided background information useful in evaluating simulation results.

Assessments of conditions with respect to each pollutant are based on state in-stream standards, where there are standards that apply. Statistical values express the minimum, maximum, and average concentrations of pollutants. Values also describe the number of times that simulated concentrations violated state standards, and the average duration of the periods of violations.

The simulation was continuous over a 3 year period. Therefore, if a standard for a particular pollutant was constantly violated over the entire simulation period, that would be reflected in the statistics for number and frequency of violations, like this:

- Number of violations: one (because there was only one violation, even though it was of 3 years' duration);
- Average duration: 26,304 hours (the total number of hours in the 3 year period).

Table 19-13 summarizes pollutant levels simulated for the Fox River under existing conditions. The computer simulation indicates violations of the ammonia nitrogen standard for all reaches except Reach 106, Nippersink Creek, and Reaches 113 and 121, the upper Fox including the Chain-of-Lakes. The worst ammonia nitrogen violations were in Reach 117, Squaw Creek, which is the receiving water for the Round Lake Sanitary District plant.

Phosphate concentrations in all reaches were in excess of .05 mg/l, with concentrations continually above this level in Reach 32, upper Nippersink Creek; and Reach 270, Flint Creek.

Mean biochemical oxygen demands (BOD) were high in all reaches except Nippersink Creek.

Dissolved oxygen has been used by the Commission as the principal indicator of water quality. Conditions with respect to DO in the Fox River are described in Table 19-14. Violations of the DO standard were simulated in all reaches except Reach 113, the Fox River above the Grass Lake outlet, and Reach 340, Tyler Creek. The severity of the DO violations tends to increase moving downstream along the mainstem. The poorest water quality was noted in Reaches 121, 310, 370, and 480.

Pollutant Loadings and Sources

Water quality in the Fox River is typically fair to good, as simulated for existing conditions. This judgment is made with respect to the constituents being modeled, particularly dissolved oxygen, ammonia, phosphate, nitrate, algae levels, and water temperature. Constituents such as pesticides, toxic substances, and turbidity have not been modeled, and their impacts on water quality have not been assessed. Oxidizable materials and nutrients entering

TABLE 19-13: STATISTICAL SUMMARY OF CURRENT WATER QUALITY

Parameter (Standard) (All data in mg/l)	REACHES				
	31	106	113	117	121
BOD (No Standard) (1) Maximum	30.8	32.0	24.3	79.4	22.4
Minimum	1.1	1.9	11.2	2.0	8.5
Mean	6.3	6.8	17.6	11.2	12.8
AMMONIA (1.5 mg/l) Maximum	4.9	.9	.3	9.3	.2
Minimum	.1	.1	0	0	0
Mean	.5	.2	.2	1.8	.1
No. Violations	42	0	0	121	0
Avg. Duration Viol.	4	0	0	95	0
NITRATE (No Standard) Maximum	5.8	4.3	5.0	5.6	6.5
Minimum	.5	.3	0	0	0
Mean	3.1	2.4	1.2	2.5	1.8
PHOSPHATE (.05 mg/l) (2) Maximum	1.2	.6	.6	1.7	.8
Minimum	.1	0	0	0	0
Mean	.3	.2	.2	.4	.2
No. Violations	1	102	102	39	133
Avg. Duration Viol.	26300	249	221	672	141

1) Illinois Pollution Control Board Standard
2) In any reservoir or lake, or in any stream at the point where it enters any reservoir or lake.

TABLE 19-13 STATISTICAL SUMMARY OF CURRENT WATER QUALITY

Parameter (Standard) (1) (All data in mg/l)	REACHES				
	270	300	310	340	360
BOD (No Standard) Maximum	101	52.4	25.2	117	96.1
Minimum	3.1	.9	6.7	1.4	2.4
Mean	12.5	8.4	12.8	16.4	15.2
AMMONIA (1.5 mg/l) Maximum	5.1	3.6	5.6	2.7	2.8
Minimum	.2	0.0	0	.1	0.0
Mean	1.2	.3	.2	.5	.5
No. Violations	43.0	28.0	1.0	30.0	7.0
Avg. Duration Viol.	100	4.0	26.0	59.0	33.0
NITRATE (No Standard) Maximum	5.9	6.0	6.4	.1	12.7
Minimum	0	.1	0.0	.1	0.0
Mean	4.7	5.7	1.9	7.9	5.7
PHOSPHATE (.05 mg/l) (2) Maximum	2.7	2.6	4.9	1.9	4.9
Minimum	.1	0	0	0	0.0
Mean	.6	.2	.3	.4	.7
No. Violations	1	15	20	16	22
Avg. Duration Viol.	26300	1750	1250	1640	1190

1) Illinois Pollution Control Board Standard
2) In any reservoir or lake, or in any stream at the point where it enters any reservoir or lake.

TABLE 19-13: STATISTICAL SUMMARY OF CURRENT WATER QUALITY

Parameter (Standard) (1) (All data in mg/l)	REACHES				
	370	430	480		
BOD (No Standard) Maximum	29.5	114	43.7		
Minimum	6.1	2.4	6.9		
Mean	12.9	16.0	15.1		
AMMONIA (1.5 mg/l) Maximum	5.8	3.5	5.8		
Minimum	.1	0	0		
Mean	.4	.6	.3		
No. Violations	10.0	28	1		
Avg. Duration Viol.	34.0	62	34		
NITRATE (No Standard) Maximum	6.2	15.4	7.8		
Minimum	0	.5	0		
Mean	2.0	13.3	2.4		
PHOSPHATE (.05 mg/l) (2) Maximum	5.0	4.0	5		
Minimum	0	0	0		
Mean	.4	.5	.4		
No. Violations	1	59	166		
Avg. Duration Viol.	26300	440	144		

1) Illinois Pollution Control Board Standard
2) In any reservoir or lake, or in any stream at the point where it enters any reservoir or lake.

TABLE 19-14 : STATISTICAL SUMMARY OF CURRENT DISSOLVED OXYGEN LEVELS

SIMULATED DO CHARACTERISTICS (Expressed in mg/l)	REACH				
	31	106	113	117	121
Maximum	12.9	13.0	14.0	13.8	13.7
Minimum	2.1	4.0	5.7	3.3	2.7
Mean	7.4	9.69	10.8	7.6	10.0
*No. of Violations	49	3	0	16	16
Avg. Duration	25	18	0	26	113
**Overall Assessment	Good	Good	Excellent	Good	Fair

SIMULATED DO CHARACTERISTICS (Expressed in mg/l)	REACH				
	270	300	310	340	360
Maximum	11.5	13.7	13.4	14.2	13.8
Minimum	1.8	4.5	1.0	5.3	2.6
Mean	8.6	10.3	9.0	10.1	8.86
*No. of Violations	17	1	73	0	15
Avg. Duration	37	1	44	0	39
**Overall Assessment	Good	Good	Fair	Excellent	Good

SIMULATED DO CHARACTERISTICS (Expressed in mg/l)	REACH				
	370	430	480		
Maximum	13.1	13.7	13.3		
Minimum	.05	1.7	1.9		
Mean	7.90	9.2	9.4		
*No. of Violations	75	10	97		
Avg. Duration	54	27	15		
**Overall Assessment	Fair	Good	Fair		

*With respect to minimum state standard of 5.0 mg/l

**Based on percent of time DO levels were above 5.0 mg/l. Possible ratings are: Excellent, Good, Fair, Poor, and Bad

Illinois from Wisconsin are represented as boundary conditions. Overall, pollutant loads in the modeled portion of the Fox River basin are relatively low. The basin is largely rural with the predominant types of land cover being grassland (pasture) and cropland. An analysis of pollutant loads and water quality is presented below for reaches in three major sections of the basin: Reach 106, which summarizes the pollutants in Nippersink Creek; Reach 121, which summarizes sources upstream of Johnsburg Road, thus, covering all tributaries to the mainstem above that point, as well as the Chain-of-Lakes and pollutants entering Illinois from Wisconsin; and Reach 480, at Montgomery Dam, which summarizes all sources of pollutants impacting on the Fox above that point, i.e. the entire Fox basin in northeastern Illinois. Table 19-15 is a summary of pollutant loads by source. While these data are more meaningful when combined with data on area and flow, Table 19-15 does give a general picture of the significance of various sources in the basin. In Table 19-16, statistics on flow and area are combined with data showing the percentage of each pollutant from various sources in Reaches 106, 121, and 480. These data are based on the input to the simulation model and represent the cumulative upstream contributions of the listed pollutants. However, they do not reflect any reactions occuring within the streams. Care must be exercised in interpreting the percentage figures in Table 19-15. Notwithstanding any such high percentage figures which appear in the table, consideration must be given to the total area contributing and the total amounts of each pollutant.

Point Sources

Point sources contribute a relatively small portion of the total flow in the Fox River but account for a disproportionate amount of the BOD, ammonia and phosphorous load due to their relatively high pollutant concentrations. In certain tributaries of the Fox, point sources supply the major pollutant loads. On the mainstem, however, dilution is more significant, thus, lessening the impact of point source effluents. In general, point source effluent quality is quite variable, with some plants producing effluent not meeting secondary (30/30) standards. However, most of the larger plants are in the secondary-tertiary categories.

The impact of point sources is most important during low-flow conditions when dilution is relatively low. One impact of point sources is their contribution of oxygen demanding pollutants, i.e. carbonaceous biochemical oxygen demand and ammonia. However, there were few problems with dissolved oxygen concentrations in most of the reported reaches during low-flow conditions. Low-flow DO problems were simulated in several reservoir reaches, particularly on the mainstem. There were frequent violations of the 5 mg/l standard simulated during summer and fall dry weather periods in these reservoirs.

It is important to note that there are several factors which impact on the capacity of a stream to assimilate oxygen demanding wastes. These relate to flow (or velocity) conditions in the stream. In the Fox, there are several low head dams which restrict flow, resulting in very low stream velocities. These conditions result in standing water, permitting the decay of pollutants, the deposition of suspended solids, and the formation of bottom deposits and restricting the natural reaeration of the stream. All of these factors contribute to a reduced capacity to assimilate oxygen demanding wastes. Furthermore, the channel gradient throughout the Illinois

TABLE 19-15POLLUTANT CONTRIBUTIONS BY SOURCE CATEGORY, EXISTING CONDITIONS
REACH: 480

PARAMETER	POINT SOURCES			NON-POINT SOURCES			Total Loads
	Comb Sewers	Treatment Plants	Boundary Conditions	Pervious Surfaces		Impervious	
				Surface	Ground	Surface	
BOD Load (tons/year)	311	1210	11400	643	1124	1170	11858
% Total Load	2	8	72	4	7	7	100
AMMONIA Load (tons/year)	24.4	620	126	145	103	39.5	1058
% Total Load	2	59	12	14	10	4	100
NITRATE Load (tons/year).	11.3	177	702	173	4172	19.5	5255
% Total Load	0	4	13	3	79	0	100
PHOSPHATE Load (tons/year)	6.83	66	86.8	16.7	182	19.5	378
% Total Load	2	17	23	4	48	5	100

portion of the mainstem Fox is relatively flat due to the influence of dams which results in low stream velocities and correspondingly low assimilative capacities. In contrast are the steeper sloped tributary streams which have relatively greater capacity to assimilate a given in-stream pollutant concentration but, because of their smaller tributary areas, also provide less dilution for point source discharges.

Another factor affecting dissolved oxygen is the presence of large algal populations. Algae "produce" oxygen during daylight hours and "consumer" oxygen at night. Because there is a net increase in oxygen due to algae, they generally have a positive influence on DO conditions. When algae die off, however, the decaying materials become a source of oxygen demand and may depress DO levels.

In addition to their impacts on dissolved oxygen levels, point sources contribute significant amounts of ammonia which contribute to violations of the 1.5 mg/l in-stream ammonia standard. These violations are most significant in tributary reaches where there is little dilution for point source discharges. Point sources also add nitrate and phosphate loads, which contribute to algal growth.

It should be noted that major pollutant loads are represented under "boundary conditions," which describe the quality of Wisconsin waters entering Illinois. Boundary conditions contribute approximately 72 percent of the BOD load imposed on the Illinois Fox River from the Wisconsin state line to Montgomery, at the Kendall county line. However, BOD loads from Wisconsin are degraded in the Fox Chain-of-Lakes and most likely have little impact on downstream conditions. Boundary conditions are responsible, also, for major inputs of algal nutrients, nitrate and phosphate, which contribute to the severe eutrophication problems in the Chain-of-Lakes and downstream.

'TABLE 19-16 : SOURCES OF POLLUTANTS, EXISTING CONDITIONS

REACH/SOURCE	PERCENTAGES					
	AREA	STREAM FLOW	POLLUTANTS			
			BOD	NH_3	NO_3	PO_4
1. Nippersink Creek						
(REACH NO. 106)						
BOUNDARY CONDITIONS						
POINT SOURCES		2	20	36	1	10
COMBINED SEWERS		–				
PERVIOUS COVER	93					
Surface Runoff		3	11	27	5	6
Groundwater		81	32	26	93	75
IMPERVIOUS COVER	7	14	36	11	1	9
2. Fox River at Johnsburg						
(REACH NO. 121)						
BOUNDARY CONDITIONS	72	69	89	36	44	46
POINT SOURCES		1	2	34	1	8
COMBINED SEWERS						
PERVIOUS COVER	27					
Surface Runoff		1	1	12	3	3
Groundwater		25	4	13	52	39
IMPERVIOUS COVER	2	4	4	5	1	4
3. Fox River at Montgomery Dam						
(REACH NO. 480)						
BOUNDARY CONDITIONS	50	46	72	12	13	23
POINT SOURCES		4	8	59	4	17
COMBINED SEWERS	–	–	2	2	–	
PERVIOUS COVER	47					
Surface Runoff		3	4	14	4	5
Groundwater		40	7	10	79	48
IMPERVIOUS COVER	3	7	7	4	–	5

Pervious Sources

Runoff from pervious land cover contributes the largest portion of water to streamflow; approximately 93 percent of the streamflow is groundwater, and 7 percent is surface runoff. Surface runoff is highly polluted compared to groundwater and, thus, accounts for a disproportionate amount of the pollutant load.

Surface loadings of pollutants are typically associated with animal excrement, decayed vegetation, and air pollution fallout. In addition, there are nonpoint source loads associated with fertilizer applications on croplands and urban grasslands, such as private lawns, golf courses, and parks. Septic systems are also contributors when they malfunction.

Modeling results have shown that there are violations of the dissolved oxygen standard in the Fox River system during wet weather periods. These violations are associated with the surface wash-off of oxygen demanding pollutants (BOD and ammonia). The duration and frequency of violations is quite variable, however. In general, wet weather DO violations are of longer duration in the mainstem Fox than in tributary reaches. Also, violations are generally more frequent in tributary reaches than in mainstem reaches, particularly during the warmer months when algal populations are large in the mainstem.

Groundwater generally has a beneficial effect on water quality. Being of better quality than the other components of streamflow, it provides a diluting effect. However, associated with groundwater are major loads of nitrate and phosphate which contribute to eutrophication.

Impervious Sources

Runoff from impervious surfaces accounts for a significant portion of the pollutant load in the Fox River basin. In the modeled (Illinois) portion of the basin, impervious wash-off contributes approximately 25 percent of the BOD load. This load is particularly significant in its impact on water quality, due to its shock load effect. Runoff from impervious areas reaches streams rapidly and produces a sudden increase in streamflow and in concentrations of certain pollutants, particularly BOD. As a result, the stream's assimilative capacity may be exceeded and DO levels severely depressed. This is more likely to be the case in Fox tributaries than in the mainstem where dilution is greater.

Combined Sewer Overflows

Overflows from combined sewers exert a relatively small pollutant load on the Fox River. The impact of combined sewer overflows is similar to the impact of impervious runoff, though smaller in magnitude overall. Combined sewer impacts are, however, significant locally and are obviously undesirable from an aesthetic or public health point of view.

e. Unmodeled Areas - Fox River Tributaries

The southwestern portion of Kane County is drained by a number of streams which are ultimately tributary to the Fox River. However, since these streams exit the region into Kendall County prior to discharging to the Fox, they were not considered in 208 modeling studies. The subject drainage area consists of Kaneville, Blackberry, Big Rock, and Sugar Grove townships. The area is primarily agricultural. The villages of Elburn and Sugar Grove are the only incorporated municipalities. Big Rock Creek (with its east and west branch tributary and Welch Creek tributary) and Blackberry Creek (with its Lake Run tributary) are the streams draining the area. The only sampling results available for the area are from IEPA data.

The IEPA does not maintain any water quality sampling stations on these streams in Kane County. Two sampling stations are located farther downstream in Kendall County, however, at the following locations:

- Blackberry Creek - at River Road bridge, Yorkville.
- Big Rock Creek - at River Road bridge, near Plano.

Table 19-17 presents the results of IEPA sampling in 1975 at the two sites.

For those pollutants listed which have applicable standards, violations occurred for fecal coliform at both stations and for total iron at the Blackberry Creek station. While not set forth in Table 19-17, a single violation of the lead standard was recorded for the Blackberry Creek station, and violations of the copper standard occurred at both stations. Overall, however, water quality in the streams is considered to be relatively good based on IEPA water quality indices.

The IEPA has developed water quality indices for all of its sampling stations, based on sampling results over time for dissolved oxygen, fecal coliform, total dissolved solids, and ammonia nitrogen. Using these indices, the IEPA classifies conditions at each station as to overall water quality.

For 1975 (the most recent year of index record) both Big Rock Creek and Blackberry Creek were rated "good or balanced," which is the highest of four ratings which can be assigned under the index system. Indeed, over the 4-year, 1972-1975 period, Big Rock Creek has consistently achieved the good or balanced rating. During that same period, Blackberry Creek has achieved a good or balanced classification for 3 of the 4 years of record (with an "average" rating being assigned in 1974). The index results again point to a generally high level of water quality in each stream.

Another source of data on existing water quality in these unmodeled areas was a 1975 biological survey conducted along a 4-mile reach of the East Branch of Big Rock Creek near Big Rock. Conditions were found to vary from semi-polluted to unbalanced along the reach. Similar data are not available for Blackberry Creek

TABLE 19-17: IEPA SAMPLING DATA (1975),

BLACKBERRY CREEK AND BIG ROCK CREEK

	Fecal Coliform #/100 ml.	DO mg/l	Total P mg/l	Nitrate N mg/l	Ammonia N mg/l	Total Iron mg/l	TDS mg/l	p^H
Blackberry Creek								
MAX.	2200	14.2	0.23	4.7	0.12	1.1	480	8.8
MIN.	100	7.6	0.05	0.6	0.0	0.3	380	8.2
MEAN.	261	11.1	0.1	2.8	0.05	0.7	420	8.4
Big Rock Creek								
MAX.	1200	13.2	0.4	8.4	0.2	0.5	450	8.8
MIN.	100	9.4	0.16	2.7	0.04	0.1	370	8.1
MEAN	266	11.3	0.29	4.9	0.11	0.2	408	8.4

The final source of information on these watersheds was this Commission's runoff sampling program.

Stormwater runoff water quality samples were taken from the East Branch of Big Rock Creek at Perry Road in Kaneville Township. Stage-activated automatic samplers were used to collect 12 samples at uniform time intervals during the rise and fall of the storm hydrograph. A total of seven storm events were sampled during the late spring and summer of 1977. The overall purpose was to obtain information on the pollutional load carried off the land surface during wet weather.

A comparison of the mean sample values obtained at the Perry Road site with the composited mean values obtained at all agricultural land use runoff sites (4 sites in all, including Perry Road) is given in Table 19-18.

TABLE 19-18: COMPARISON OF MEAN SAMPLE VALUES OF PERRY ROAD SITE WITH MEAN SAMPLE VALUES OF ALL AGRICULTURAL SITES
(all parameters in mg/l except pH)

PARAMETER	ALL SITES	PERRY ROAD
pH	7.6	7.6
Alkalinity	167	116
Hardness	292	256
Total Suspended Solids	421	1349
Volatile Suspended Solids	226	168
Total Solids	833	1660
BOD_5	10.8	13.6
BOD_{20}	21.7	31.7
Total Kjeldahl Nitrogen	2.1	3.4
Ammonia	0.3	0.4
Nitrate + Nitrite	3.9	4.1
Soluble Phosphorous	0.18	0.37
Silica	16.7	30.4

Mean values for the Perry Road site exceeded the mean values for all agricultural sites for 9 of the 13 parameters reported. Of special note are the higher relative values for total solids, BOD, and nutrients.

19.04 POINT SOURCES: EXISTING CONDITIONS

a. Municipal Type Wastewater Treatment Plants

There are 38 municipal type wastewater treatment facilities in the Fox River basin. Thirty-three plants are publicly owned and five are private utilities. Most of the plants are between 1 and 5 mgd average capacity and serve the needs of a single community.

None of the municipal plants in the basin currently employ tertiary filtration. The Crystal Lake plant No. 3 utilizes the rotating bio-disc secondary treatment process, which provides significant nitrification. None of the other plants employ distinct nitrification facilities. The facilities plans for Barrington, Sanitary District of Elgin (SDE), the Aurora Sanitary District (ASD), Lake-in-the-Hills, Northwest Lake (Fox Lake), and Wauconda call for nitrification through the use of rotating bio-discs on single stage activated sludge. The SDE, ASD, and Barrington FPAs also plan to add tertiary filtration facilities. Phosphorous removal facilities are planned or are in operation for all municipal plants.

Specific information on these municipal type plants, including existing planning costs, is contained in Table 19-19a through 19-19e. The location of point sources in the basin is shown in Figure 19-5.

b. Industrial Wastewater Plants

There are six industrial wastewater treatment plants in the basin. Current information available for these facilities, including treatment units, flows, and effluent limitations is presented in Table 19-20a and 19-20b.

c. Miscellaneous Wastewater Treatment Plants

Current information available on the 41 miscellaneous type wastewater treatment facilities in the basin, including treatment units, flows, and effluent limitations is shown in Tables 19-21a and 19-21b.

d. Other Wastewater Dischargers

There are 56 other facilities which discharge their wastewater to the Fox River. Data on these dischargers, which include cooling water discharges and private stormwater discharges, is presented in Tables 19-22a and 19-22b.

TABLE 19-19 A: MUNICIPAL-TYPE WASTEWATER TREATMENT PLANTS

FOX RIVER BASIN

MAP CODE	FACILITY NAME	FACILITY PLANNING AREA / LEAD AGENCY	NEAREST MUNICIPALITY	RECEIVING STREAM			PUBLICLY OWNED TREATMENT WORKS		
				NAME	7 DAY 10 YR. LOW FLOW (MGD)		NO	YES	IEPA FY 78 PRIORITY NO.
					1970	2000			
M1	Algonquin	S.E.McHenry/None	Algonquin	Fox River	35.3			X	-
L1	Antioch	N.W.Lake/LCDPW	Antioch	Sequoit Creek	0.40			X	932
K1	Aurora	Aurora/Aurora SD	Aurora	Fox River	68.5			X	224
L2	Barrington	Barrington/Barrington	Barrington	Flint Creek	0.10			X	35
K2	Batavia	Batavia/Batavia	Batavia	Fox River	57.5			X	158
K3	Carpentersville Kimble Hill Plant	Carpentersville/ Carpentersville	Carpentersville	Fox River	36.2			X	29
K4	Carpentersville Main Plant	Carpentersville/ Carpentersville	Carpentersville	ditch to Fox River	0			X	-
M2	Cary	S.E. McHenry/None	Cary	Fox River	32.7			X	-
M3	Crystal Lake 1 & 2	S.E. McHenry/None	Crystal Lake	Crystal Lake	0.06			X	-
M4	Crystal Lake 3	S.E. McHenry/None	Crystal Lake	Sleepy Hollow Ck	0			X	-
K5	East Dundee	South Dundee/ West Dundee	East Dundee	Fox River	39.1			X	125
K6	Elburn	Elburn/Elburn	Elburn	Welch Creek	0			X	81
K7	Elgin SD-North	Elgin/Elgin SD	Elgin	Fox River	40.7			X	102
K8	Elgin SD-Main	Elgin/Elgin SD	Elgin	Fox River	49.4			X	159
K9	Elgin SD-West	Elgin/Elgin SD	Elgin	Fox River	40.7			X	159
K10	Ferson Creek U.C.	None	St. Charles	Ferson Creek	0		X		-

TABLE 19-19 A: MUNICIPAL-TYPE WASTEWATER TREATMENT PLANTS

FOX RIVER BASIN

MAP CODE	FACILITY NAME	FACILITY PLANNING AREA / LEAD AGENCY	NEAREST MUNICIPALITY	RECEIVING STREAM			PUBLICLY OWNED TREATMENT WORKS		
				NAME	7 DAY 10 YR. LOW FLOW (MGD) 1970	2000	NO	YES	IEPA FY 78 PRIORITY NO.
L5	Fox Lake	N.W.Lake/LCDPW	Fox Lake	Myers Bay on Pistakee Lake	0			X	22
L6	Fox Lake U.C. Tall Oaks	N.W.Lake/LCDPW	Fox Lake	Nippersink Crk.	0		X		
M5	Fox River Grove	Fox River Grove/Fox River Grove	Fox River Grove	Fox River	31.7			X	33
K11	Geneva	Eastern Kane County/ St. Charles	Geneva	Fox River	53.2			X	1015
M7	Hebron	Hebron/Hebron	Hebron	ditch to North Br. Nppsk. Crk.	0			X	175
L10	Island Lake	Island Lake/Island Lk.SD	Island Lake	Fox River	29.7			X	249
L11	Lake Barrington Homeowners	Barrington/Barrington	Lake Barrington	Flint Creek			X		-
M9	Lake-in-the-Hills Sanitary District	Lake-in-the-Hills S.D./ Lake-in-the-Hills S.D.	Lake-in-the-Hills	Crystal Creek	1.74			X	135
L20	Lake Villa	N.W.Lake/LCDPW	Lake Villa	Eagle Creek	0			X	136
L21	Lake Zurich Northwest	Lake Zurich/ Lake Zurich	Lake Zurich	ditch to Grassy Lake	0			X	576
M11	McHenry	McHenry/McHenry	McHenry	Fox River	28.7			X	-
C10	MSDGC Streamwood	Elgin/Elgin S.D.	Streamwood	East Branch of Popular Creek	0			X	101
K13	Prestbury U.C.	Sugar Grove/Sugar Grove	Sugar Grove	ditch to Blackberry Creek	0		X		-
M12	Richmond	Richmond/Richmond	Richmond	North Branch of Nippersink Crk.	2.46			X	-
K14	Valley Water Co., Inc. River Grange Lake Sub.	Eastern Kane County/ St. Charles	Elgin	Private Lake to Fox River	0		X		-
K15	Rollins Sewer and Water Co.	Elgin/Elgin S.D.	Elgin	ditch to Otter Creek	0		X		-
L31	Round Lake S.D.	N.W.Lake/LCDPW	Round Lake	Long Lake to Squaw Creek	0			X	21

TABLE 19-19 A: MUNICIPAL-TYPE WASTEWATER TREATMENT PLANTS FOX RIVER BASIN

MAP CODE	FACILITY NAME	FACILITY PLANNING AREA / LEAD AGENCY	NEAREST MUNICIPALITY	RECEIVING STREAM			PUBLICLY OWNED TREATMENT WORKS		
				NAME	7 DAY 10 YR. LOW FLOW (MGD)				
					1970	2000	NO	YES	IEPA FY 78 PRIORITY NO.
K16	St. Charles	Eastern Kane County/ St. Charles	St. Charles	Fox River	51.6			X	1015
K17	St. Charles Skyline Sewer & Water Co.	Elgin/Elgin S.D.	St. Charles	ditch to Norton Creek	0		X		159
L32	Wauconda	Wauconda/Wauconda	Wauconda	ditch to Fox River	0			X	208
K18	West Dundee	South Dundee/S. Dundee	West Dundee	Fox River	39.3				125
M14	Woodstock-North	Woodstock/Woodstock	Woodstock	Silver Creek	0.90				-
M16	McHenry Shores	McHenry/McHenry	McHenry Shores	Fox River	28.7				-
M18	Wonder Lake	Wonder Lake/None	McHenry	Nippersink Crk.	5.90				-
K19	Wasco S.D.	Wasco S.D./Wasco S.D.	St. Charles	Mill Creek	0				-
K20	Sugar Grove	Sugar Grove/Sugar Grove	Sugar Grove	Blackberry Crk.	0				518

TABLE 19-19 B: MUNICIPAL-TYPE WASTEWATER TREATMENT PLANTS

FOX RIVER BASIN

MAP CODE	NPDES PERMIT			EFFLUENT REQUIREMENTS (mg/l)													COMMENTS
	NUMBER	DATE		INTERIM (A)				FINAL (A)					YEAR 2000 (B)				
		ISSUED	EXPIRES	BOD_5	TSS	P	NH_3N	EFFECTIVE DATE	BOD_5	TSS	P	NH_3N	BOD_5	TSS	P	NH_3N	
M1	0023329	12-10-73	10-29-78						30	30	1		20	25	1	(a)	(a) 1.5 mg/l in stream after mixing.
L1	0020354	7-29-74	6-8-79						4	5	1		-	-		-	
K1	0020818	12-30-74	6-30-81						10	12	1		10	12	1	(a)	
L2	0021598	6-22-77	11-30-81						10	12	1		10	12	1	(a)	
K2	0022543	6-18-75	1-31-78						20	25	1		20	25	1	(a)	
K3	0025739	11-30-73	10-29-78						30	30	1		-	-		-	
K4	0027944	6-8-77	8-31-81						20	25	1		20	25	1	(a)	
M2	0020516	1-31-74	12-31-78						20	25	1		20	25	1	(a)	
M3	0028282	6-7-77	12-31-81						10	12	1		10	12	1	(a)	
M4	0053457	1-3-77	7-31-81						10	12	1		10	12	1	(a)	
K5	0028541	6-13-77	9-30-81						30	30	1		30	30	1	(a)	
K6	0020826	6-28-77	3-31-81						10	12	1		10	12	1	(a)	
K7	0028665	12-18-74	3-31-78						20	25	1		20	25	1	(a)	
K8	0028657	6-23-76	8-30-79						10	12	1		10	12	1	(a)	
K9	0035891	6-22-77	9-30-81						20	25	1		-	-		-	
K10	0045411	6-30-75	12-31-79						4	5	1		4	5	1	(a)	

(A) From NPDES Permits (B) From Facility Plans

TABLE 19-19 B: MUNICIPAL-TYPE WASTEWATER TREATMENT PLANTS

FOX RIVER BASIN

MAP CODE	NPDES PERMIT			EFFLUENT REQUIREMENTS (mg/l)													COMMENTS
	NUMBER	DATE		INTERIM (A)					FINAL (A)				YEAR 2000 (B)				
		ISSUED	EXPIRES	BOD_5	TSS	P	NH_3N	EFFECTIVE DATE	BOD_5	TSS	P	NH_3N	BOD_5	TSS	P	NH_3N	
L5	0020958	Draft	1-31-82						10	12	1		10	12	1	(a)	(a) 1.5 mg/l instream after mixing. (b) Lagoon exemption assumed.
L6	0045144	6-18-75	12-31-78						4	5	1		-	-	-	-	
M5	0020583	6-22-77	2-28-81						30	30	1		30	30	1	(a)	
K11	0020087	10-15-73	10-14-78						20	25	1		20	25	1	(a)	
M7	0026433	7-1-77	2-28-81						10	12			(b) 30	(b) 30	-	(a)(b)	
L10	0031933	6-16-77	11-30-81						20	25	1		20	25	1		
L11	0045110	7-30-75	6-30-79						30	30			30	30		(a)	
M9	0021733	6-7-77	11-30-81						10	12	1		30	30	1	(a)	
L20	0021342	6-20-75	8-1-79						10	12	1		-	-		-	
L21	0022535	5-30-75	6-1-79						4	5	1		4	5	1	(a)	
M11	0021067	12-14-74	12-31-81						20	25	1		20	25	1	(a)	
C10	0028100	6-30-77	2-28-82						4	5	1		-	-		-	
K13	0036641	6-9-75	8-1-78						10	12	1		10	12	1	(a)	
M12	0026093	12-10-73	6-30-78						30	30	1		30	30	1	(a)	
K14	0024736	6-30-75	6-30-81						4	5	1		4	5	4	(a)	
K15	0032000	6-30-75	12-31-78						4	5	1		-	-		-	
L31	0030830	6-24-77	4-30-82						20	25	1		-	-		-	

(A) From NPDES Permits (B) From Facility Plans

TABLE 19-19 B: MUNICIPAL-TYPE WASTEWATER TREATMENT PLANTS

FOX RIVER BASIN

MAP CODE	NPDES PERMIT			EFFLUENT REQUIREMENTS (mg/l)													COMMENTS
	NUMBER	DATE		INTERIM (A)				FINAL (A)					YEAR 2000 (B)				
		ISSUED	EXPIRES	BOD_5	TSS	P	NH_3N	EFFECTIVE DATE	BOD_5	TSS	P	NH_3N	BOD_5	TSS	P	NH_3N	
K16	0022705	9-30-74	8-31-81						20	25	1		20	25	1	(a)	(a) 1.5 mg/1 in-stream after mixing.
K17	0045667	6-23-75	10-31-78						4	5	1		-	-		-	
L32	0020109	7-1-77	4-30-82						10	12	1		10	12	1	(a)	
K18	0023311	1-3-74	12-30-78						30	30	1		30	30	1	(a)	
M14	0031861	12-31-74	12-31-77						10	12	1		10	12	1	(a)	
M16	None	-	-						-	-		-	20	25	1	(a)	
M18	None	-	-						-	-		-	30	30	1	(a)	
K19	None	-	-						-	-		-	30	30	1	(a)	
K20	None	-	-						-	-		-	10	12	1	(a)	

(A) From NPDES Permits (B) From Facility Plans

TABLE 19-19 C: MUNICIPAL-TYPE WASTEWATER TREATMENT PLANTS

FOX RIVER BASIN

MAP CODE	STATUS OF TREATMENT PLANT					WASTEWATER TREATMENT PLANT (MGD)										COMMENTS
	INTERIM		PERMANENT			AVERAGE FLOWS (d)						DESIGN CAPACITIES				
	YES	PHASE OUT DATE	EXISTING	PROPOSED NEW YES	PROPOSED NEW EST. DATE IN SERVICE	1975	1980	1985	1990	1995	2000	1975	1985	OTHER YEAR	2000	
M1			X			0.87	1.20	1.45	1.77	1.95	2.12	0.85	2.12		2.12	(a) Phase out to Fox Lake
L1	X	1-90 (a)				0.50	0.67	0.84	-	-	-	1.00	1.00		-	
K1			X			21.42	33.30	38.32	43.77	48.29	53.20	32.0	40.0		40.0	(b) Phased out to Carpentersville Main Plant.
L2			X			2.77	2.95	3.13	3.31	3.49	3.68	2.00	3.68		3.68	
K2			X			1.65	2.36	3.07	3.78	4.49	5.20	2.72	5.20		5.20	(c) Phased out to Elgin-Main.
K3	X	12-79 (b)				0.06	-	-	-	-	-	0.30				
K4			X			3.39	3.82	4.67	5.52	6.16	6.97	3.50	5.00		5.00	(d) From facility plans or needs analysis documents unless noted.
M2			X			0.56	0.71	1.16	1.57	1.98	2.42	1.26	1.26	1986 2.77	2.77	
M3			X			2.60	3.23	4.05	4.93	5.85	6.82	4.50	7.00		7.00	
M4			X			-	0.30	0.40	0.50	0.60	0.70	0.50	0.50	1990 2.00	2.00	(e) NIPC estimate.
K5			X			0.42	0.57	0.72	0.87	1.02	1.19	0.58	0.97		0.97	(f) Plant will treat only combined sewer overflows.
K6			X	X	1-80	0.12	0.35	0.58	0.81	1.04	1.27	0.11	1.27		1.27	
K7			X			2.20	3.05	3.10	3.15	3.20	(e) 3.25	3.50	3.50		3.50	(g) Private utility flows assumed to be the same as 1975 flows.
K8			X			5.81	15.63	18.90	22.16	27.33	32.49	8.60	17.00		25.00	
K9	X	12-79 (c)				0.33	(f)					1.5				
K10						0.03	0.03	0.03	0.03	0.03	(g) 0.03	0.05				

TABLE 19-19 C: MUNICIPAL-TYPE WASTEWATER TREATMENT PLANTS

FOX RIVER BASIN

MAP CODE	STATUS OF TREATMENT PLANT					WASTEWATER TREATMENT PLANT (MGD)									
	INTERIM		PERMANENT			AVERAGE FLOWS (c)						DESIGN CAPACITIES			
	YES	PHASE OUT DATE	EXISTING	PROPOSED NEW YES	PROPOSED NEW EST. DATE IN SERVICE	1975	1980	1985	1990	1995	2000	1975	1985	OTHER YEAR	2000
L5			X			0.26	3.86	4.96	7.75	10.00	12.00	0.72	6.00		12.00
L6			X			0.03	0.03	0.03	0.03	0.03	0.03	0.03 (d)	0.5		
M5			X			0.42	0.59	0.76	0.93	1.10	1.25	0.39	1.25		1.25
K11			X			2.44	2.75	3.06	3.37	3.68	4.00	4.00	4.00		4.00
M7			X			0.11	0.13	0.14	0.16	0.17	0.19	0.11	0.19		0.19
L10				X	1-79	-	0.63	0.74	0.85	0.96	1.20	-	1.20	1980 1.20	1.20
L11			X			0.05	0.05	0.05	0.05	0.05	0.05	0.15			
M9			X			0.80	0.81	0.82	0.83	0.84	0.85	0.25	0.85		0.85
L20	X	12-94 (a)				0.10	0.15	0.20	0.25	-	-	0.3			
L21			X			0.71	0.88	1.05	1.22	1.39	1.54	0.80	1.00		1.00
M11			X			1.60	2.40	3.33	4.16	4.87	5.68 (e)	2.00	3.00		3.00
C10	X	12-94 (b)				2.35	-	-	-	-	-	2.9	-		-
K13			X			0.18	0.20	0.22	0.24	0.27	0.30	0.40	0.40		0.40
M12			X			0.14	0.19	0.20	0.22	0.24	0.27	0.38	0.38		0.38
K14	X		X			0.01	0.01	0.01	0.01	0.01	0.01 (d)	0.008			
K15	X	1-90 (b)				0.06	0.06	0.06 (d)	-	-	-	0.15			
L31	X	12-79 (a)				2.49	-	-	-	-	-	1.6			

COMMENTS

(a) Phased out to Fox Lake.

(b) Phased out to Elgin-Main.

(c) From Facility Plans or needs analysis documents unless noted.

(d) Private utility flows assumed equal to 1975 flows.

(e) Flows in excess of 3.0 MGD to be treated at a new regional plant.

TABLE 19-19 C: MUNICIPAL-TYPE WASTEWATER TREATMENT PLANTS FOX RIVER BASIN

MAP CODE	STATUS OF TREATMENT PLANT					WASTEWATER TREATMENT PLANT (MGD)										COMMENTS
	INTERIM		PERMANENT			AVERAGE FLOWS (b)						DESIGN CAPACITIES				
	YES	PHASE OUT DATE	EXIST-ING	PROPOSED NEW		1975	1980	1985	1990	1995	2000	1975	1985	OTHER YEAR	2000	
				YES	EST. DATE IN SERVICE											
K16			X			3.63	4.50	5.37	6.24	7.11	8.00	8.00	8.00		8.00	(a) Phased out to Elgin-Main.
K17	X	1-80 (a)				0.06	-	-	-	-	-	0.1				
L32			X			0.58	0.70	0.82	0.94	1.06	1.20	0.80	1.20		1.20	(b) From facility plans or needs analysis documents unless noted.
K18			X			0.59	0.58	0.74	0.89	0.96	1.02	0.57	0.90		0.90	
M14			X			2.07	2.28	2.49	2.70	2.91	3.12	3.50	3.50		3.50	
M16				X	1-80	-	-	0.39	0.55	0.58	0.60	0.25	(c) 3.50		3.50	(c) Assumes regional 3.5 MGD facility to be built at McHenry Shores.
M18				X	1-83	-	-	0.89	0.93	0.99	1.04	-	1.04		1.04	
K19				X	1-80	-	0.10	0.12	0.14	0.15	0.17	-	0.13		0.13	
K20				X	1-83	-	0.04	0.12	0.20	0.25	0.30	-	0.30		0.30	

TABLE 19-19 D: MUNICIPAL-TYPE WASTEWATER TREATMENT PLANT

FOX RIVER BASIN

MAP CODE	POPULATION SERVED (1000's)						PROPOSED PROJECTS (C)								CAPITAL COSTS (million $)		
							PLANT				SEWERS						
	1975	1980	1985	1990	1995	2000	Exp.	UpG	New	Out	I/I	SSE	New	Reh	Initial	Future	Total
M1	3.9	6.6	8.8	10.9	12.1	13.2	X								-	2.5	2.5
L1	3.7	6.0	6.8	-	-	-		X		X	X	X	X	X	0.6	See L5	0.6
K1	112.2					208.9	X	X			X	X	X	X	83.7	-	83.7
L2	10.3	12.0	14.9	17.7	19.6	21.5	X	X			X	X			4.2	-	4.2
K2	12.4	13.7	16.0	18.6	20.0	21.5	X				X	X		X	6.7	-	6.7
K3	0.5	-	-	-	-	-	-			X			X		0.8	-	0.8
K4	24.9	31.4	35.1	38.8	40.4	42.0	X				X	X				-	
M2	5.0	6.2	9.6	12.6	15.8	18.9	X				X				-	4.2	4.2
M3	18.0	18.5	25.2	29.6	34.2	39.7	X	X							-	8.6	8.6
M4	-	5.2	5.9	6.8	9.1	10.4	X								-	SEE M3	
K5	2.7	3.6	4.4	5.2	5.7	6.3	X				X	X		X	1.8	-	1.8
K6	1.2	2.3	3.5	4.6	4.8	5.2	X	X			X	X			3.1	-	3.1
K7	14.0	14.5	15.0	15.5	16.0	16.5	X				X	X				SEE K8	
K8	64.0	117.0	134.9	152.6	165.9	179.1	X	X			X	X			13.0	-	13.0
K9	0.4	-	-	-	-	-				X	X					SEE K8	
K10															PRIVATE	COSTS	

(C) PROPOSED PROJECTS

SEWER(S): I/I - Infiltration/Inflow Study; SSE - Sewer System Evaluation; New - New Sewer Construction; Reh - Rehabilitation of Existing Sewers

PLANT: Exp - Expansion; UpG - Upgrading; New - New plant; Out - Phase out

TABLE 19-19 D: MUNICIPAL-TYPE WASTEWATER TREATMENT PLANT FOX RIVER BASIN

MAP CODE	POPULATION SERVED (1000's)						PROPOSED PROJECTS (C)								CAPITAL COSTS (million $)		
							PLANT				SEWERS						
	1975	1980	1985	1990	1995	2000	Exp.	UpG	New	Out	I/I	SSE	New	Reh	Initial	Future	Total
L5	4.9	44.9	51.0	64.3	73.8	80.9	X	X			X	X	X	X	10.0	8.8	18.8
L6															PRIVATE COSTS		
M5	2.0	4.1	5.2	6.2	6.7	7.2	X				X	X	X	X	2.9	-	2.9
K11	12.7	14.4	16.9	19.3	21.2	23.0					X	X			UNKNOWN		
M7	0.9	0.9	1.1	1.1	1.2	1.3		X			X				0.5	0.1	0.6
L10	-	7.7	8.8	9.9	10.9	12.0			X				X		5.9	-	5.9
L11															PRIVATE COSTS		
M9	4.7	6.0	6.3	6.6	7.1	7.5	X	X			X	X			1.4	-	1.4
L20	1.2	1.7	2.1	2.4				X		X	X	X	X	X	0.5	SEE L5	0.5
L21	3.6	5.6	7.2	8.8	10.5	12.2	X	X			X	X			0.3	1.1	1.4
M11	8.5	14.0	19.7	25.4	19.8	34.2	X						X		2.2	8.4	10.6
C10	34.5	-	-	-	-	-				X					SEE TABLE 19-		
K13															PRIVATE COSTS		
M12	1.2	1.5	1.6	1.7	2.0	2.2									NONE		
K14															PRIVATE COSTS		
K15				-	-	-									PRIVATE COSTS		
L31	19.0	-	-	-	-	-				X	X	X	X	X	0.2	See L5	0.2

(C) PROPOSED PROJECTS

SEWER(S): I/I - Infiltration/Inflow Study; SSE - Sewer System Evaluation; New - New Sewer Construction; Reh - Rehabilitation of Existing Sewers

PLANT: Exp - Expansion; UpG - Upgrading; New - New plant; Out - Phase out

TABLE 19-19 D: MUNICIPAL-TYPE WASTEWATER TREATMENT PLANT FOX RIVER BASIN

MAP CODE	POPULATION SERVED (1000's)						PROPOSED PROJECTS (C)								CAPITAL COSTS (million $)		
							PLANT				SEWERS						
	1975	1980	1985	1990	1995	2000	Exp.	UpG	New	Out	I/I	SSE	New	Reh	Initial	Future	Total
K16	17.3	20.8	26.9	33.2	35.6	38.0					X	X			UNKNOWN		
K17		-	-	-	-	-											
L32	6.4	7.4	8.4	9.4	10.4	11.3	X	X			X	X		X	3.0	-	3.0
K18	3.1	5.2	6.3	7.3	10.5	10.9	X				X	X		X	2.4	-	2.4
M14	10.8	10.8	11.9	14.0	16.7	20.2					X	X		X	-	1.9	-
M16	-	2.0	3.4	4.8	4.9	5.0			X				X		1.4	1.8	3.2
M18	-	-	8.9	9.3	9.9	10.0			X				X		-	3.6	3.6
K19	-	0.3	0.4	0.5	0.6	0.7			X				X		0.4	-	0.4
K20	-								X				X		1.0	-	1.0

(C) PROPOSED PROJECTS

SEWER(S): I/I - Infiltration/Inflow Study; SSE - Sewer System Evaluation; New - New Sewer Construction; Reh - Rehabilitation of Existing Sewers

PLANT: Exp - Expansion; UpG - Upgrading; New - New plant; Out - Phase out

TABLE 19-19 E. MUNICIPAL-TYPE WASTEWATER TREATMENT PLANTS

FOX RIVER BASIN

MAP CODE	FACILITY PLANS												COMMENTS
	TYPE		STATUS			REVIEWS / APPROVALS							
						NIPC			IEPA				
	NEEDS ANALYSIS	STEP ONE STUDY	COMPLETED	UNDER WAY	LOCAL ISSUES	NUMBER	ENDORSED	UNDER REVIEW	NUMBER	APPROVED	UNDER REVIEW	UN-RESOLVED ISSUES	
M1	X		X			77-A-009	X			X			(a) Needs Analysis approved. Supplemental Step I underway. (b) Private plant.
L1		X	X			75-236	X		C17-1567	X			
K1		X	X			76-689	X		C17-1407		X		
L2		X	X			76-363	X		C17-1462				
K2		X	X						C17-1931	X			
K3		X	X						C17-1412	X			
K4		X	X						C17-1412	X			
M2	X	X (a)	X	X	X	78-022	X		C17-	X		X	
M3	X	X (a)	X	X	X	78-090	X		C17-2140	X		X	
M4	X	X (a)	X	X	X	78-090	X		C17-2140	X			
K5		X	X						C17-1395		X		
K6		X	X			76-103	X		C17-1092	X			
K7		X	X			76-487	X		C17-1765		X		
K8		X	X			76-487	X		C17-1765		X		
K9		X	X			76-487	X		C17-1765		X		
K10		(b)											

TABLE 19-19 E. MUNICIPAL-TYPE WASTEWATER TREATMENT PLANTS

FOX RIVER BASIN

MAP CODE	FACILITY PLANS												COMMENTS
	TYPE		STATUS			REVIEWS / APPROVALS							
						NIPC			IEPA				
	NEEDS ANALYSIS	STEP ONE STUDY	COMPLETED	UNDER WAY	LOCAL ISSUES	NUMBER	ENDORSED	UNDER REVIEW	NUMBER	APPROVED	UNDER REVIEW	UNRESOLVED ISSUES	
L5		X	X		X	75-326	X		C17-1567	X		X	(a) Private plant
L6													
M5		X	X			76-233	X		C17-1435	X			
K11		X		X									
M7		X	X							X			
L10		X	X			77-056	X		C17-1510	X			
L11	(a)												
M9		X	X			76-831	X		C17-1862	X			
L20		X	X			75-326	X		C17-1567	X			
L21		X		X	X				C17-1419		X	X	
M11	X		X		X	77-A-010	X			X		X	
C10		X	X			75-360			C17-5416	X			
K13	(a)												
M12	X		X				X			X			
K14	(a)												
K15	(a)												
L31		X	X			75-326	X		C17-1567	X			

TABLE 19-19 E. MUNICIPAL-TYPE WASTEWATER TREATMENT PLANTS FOX RIVER BASIN

MAP CODE	FACILITY PLANS												COMMENTS
	TYPE		STATUS			REVIEWS / APPROVALS							
						NIPC			IEPA				
	NEEDS ANALYSIS	STEP ONE STUDY	COMPLETED	UNDER WAY	LOCAL ISSUES	NUMBER	ENDORSED	UNDER REVIEW	NUMBER	APPROVED	UNDER REVIEW	UN-RESOLVED ISSUES	
K16		X		X									(a) Private plant.
K17	(a)												
L32		X	X		X		X				X	X	
K18		X	X						C17-1395		X		
M14		X	X						C17-2093		X		
M16	X		X		X	77-A-010	X			X		X	
M18	X		X		X	77-A-007	X			X		X	
K19	X		X			77-A-013	X			X			
K20		X	X			77-463	X		C17-2319		X	X	

TABLE 19-20 A: INDUSTRIAL WASTEWATER TREATMENT PLANTS

FOX RIVER BASIN

MAP CODE	FACILITY NAME	NPDES PERMIT NUMBER	FACILITY PLANNING AREA / LEAD AGENCY	NEAREST MUNICIPALITY	TREATMENT UNITS(1)	WASTEWATER LOADS MGD			
						CURRENT		1985	2000
						DESIGN CAPACITY	1975 LOAD		
M5	Dodge Trophies	0034711	S.E. McHenry/None	Cary	K,E,IS	-	-	-	-
K1	E.W.Kneip, Inc. (Elburn Packing)	0047449	Elburn/Elburn	Elburn	IS	0.400	0.500		0.500
M6	Hebron Lagoons	0026433	Hebron/Hebron	Hebron	LO	0.100	0.180	-	0.230
K2	Moline Malleable Iron Co.	0002810	Eastern Kane/ St.Charles	St. Charles	K	0.222	0.030	-	0.030
L2	Travenol Labs.	0024074	N.W.Lake/LCDPW	Round Lake	A,L,E	0.100	0.365	-	0.365
M8	Woodstock Die Cast Co.	0033863	Woodstock/ Woodstock	Woodstock	K	1.000	0.410	-	0.410
(1):	Activated sludge (A), chlorination (E), subsurface application (IS), special treatment (K), tertiary lagoon (L), stabilization lagoon (LO).								

(1) See key.

TABLE 19-20 B: INDUSTRIAL WASTEWATER TREATMENT PLANTS

FOX RIVER BASIN

MAP CODE	RECEIVING STREAM			NPDES PERMIT DATES		SIC CODE	EFFLUENT REQUIREMENTS[1] (mg/l)	COMMENTS
	NAME	7 DAY-10 YR. LOW FLOW (MGD)						
		1970	2000	ISSUED	EXPIRES			
M5	Subsurface	N/A				67-3499		
K1	Subsurface	N/A		5-30-75	3-31-78	-	4 BOD, 5 TSS, 1.5 (DM) NH_3-N, 1.0 (DM) P	
M6	ditch to N.Br. of Nippersink Creek	0		7-1-77	2-28-81	72-4952	40 BOD, 50 TSS	
K2	ditch to Fox River	0		9-30-74	12-31-77	72-3310	Temp., 750 TDS, 15 TSS, 10 o/g, 2 (tot) Fe	
L2	ditch to Lure Lake	0		3-13-75	12-31-79	67-2833	10 BOD, 12 TSS	
M8	Storm sewer to S. Br. of Nippersink Ck	0		6-30-75	3-31-78	72-3361	10 BOD, 12 TSS, 1.5 NH_3-N, 1.0 (DM) P, .025 (DM) Cn	

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(1) Current, from NPDES Permits

TABLE 19-21 A: MISCELLANEOUS WASTEWATER TREATMENT PLANTS

FOX RIVER BASIN

MAP CODE	FACILITY NAME	NPDES PERMIT NUMBER	FACILITY PLANNING AREA / LEAD AGENCY	NEAREST MUNICIPALITY	TREATMENT UNITS$^{(1)}$	WASTEWATER LOADS MGD			
						CURRENT DESIGN CAPACITY	CURRENT 1975 LOAD	1985	2000
L1	Allendale Boys School	None	NW Lake/LCDPW	Lake Villa	IM, F,E	0.011	0.020	–	0.020
L4	Barrington Hills CC	0048097	Barrington/ Barrington	Barrington	A,E	0.050	0.025	–	0.025
K1	Broadview Coll.	0025411	None	Elburn	L	0.016	0.020	–	0.020
L5	Camp Hickory	0046043	NW Lake/LCDPW	Round Lake	IM,F,E	0.001	0.001	–	0.001
L6	Moody Youth Camp Moyota	0038334	NW Lake/LCDPW	Antioch	S,FB,E		0.002	–	0.002
M2	Catholic Charities-Chgo	0049051	Spring Grove/ Sunnyside	Sunnyside		0.0014		–	
L7	Chain-O-Lakes State Park	None	NW Lake/LCDPW	Fox Lake	AD,IS	0.0075	0.003	–	0.003
D10	Fermi Nat'l Acc'l Lab	0026123	Fermi Lab/None	Batavia	AD,F,E	0.050	0.040	–	0.040
K3	Fisherman's Inn Mercers Rest.	0048887	None	Elburn	AD,FB	0.002		–	
L11	Fremont School	0034746	NW Lake/LCDPW	Mundelein	A,L,E	0.012	0.0025	–	0.0025
M3	Fritzche Est.	None	Island Lake/ Island Lake SD	Lakemoor	AD	0.005	0.001	–	0.001
L14	Heppner Mfg.	0037168	NW Lake/LCDPW	Round Lake	IM,F,E	0.010	0.005	–	0.005
L16	Henry Horner Camp	0054615	NW Lake/LCDPW	Round Lake		0.014		–	
K5	Ill. Tollway Bldg #9	0048984	Elgin/Elgin SD	Elgin		0.0005		–	
K6	Ill. Boys Training School	0026808	None	St. Charles	AC,L,E	0.350	0.250	–	0.250
K7	Kaneland School	0026603	None	Elgurn	AC,FT,E	0.030	0.022	–	0.022
L21	Klingberg Sch.	0050661	Wauconda/ Wauconda	Wauconda	AC,F,E	0.030	0.0085	–	0.0085

[1] See key.

TABLE 19-21 A: MISCELLANEOUS WASTEWATER TREATMENT PLANTS

FOX RIVER BASIN

MAP CODE	FACILITY NAME	NPDES PERMIT NUMBER	FACILITY PLANNING AREA / LEAD AGENCY	NEAREST MUNICIPALITY	TREATMENT UNITS(1)	WASTEWATER LOADS MGD			
						CURRENT			
						DESIGN CAPACITY	1975 LOAD	1985	2000
L22	Koeneman Sausage Co.	0038067	NW Lake/LCDPW	Volo	IM,L,E	0.014	0.015	–	0.015
D13	Lab Tek Prod. Miles Lab,Inc.	0024147	Naperville/ Naperville	Naperville	AD,F,L,E	0.0075		–	
M4	Lake Manor Motel	None	SE McHenry Co./ None	Crystal Lake	AD,L,E	0.0072	0.005	–	0.005
M5	Modine MFG.	0001279	McHenry/McHenry	Ringwood	AD,L		0.100	–	0.100
K8	Moosehart Child City	0027260	Batavia/Batavia	Moosehart	IM,FT,E	0.200	0.125	–	0.125
L26	Mt. St. Joseph Home	0027286	Lake Zurich/ Lake Zurich	Lake Zurich	IM,F,E	0.025	0.014	–	0.014
K9	National Electronics#001	0024333	None	Geneva	L,E	0.008	0.006	–	0.006
M6	National Worth Wd.	None	SE McHenry Co./ None	Cary	K,IS		0.006	–	0.006
L27	North Barrington School	0024716	Barrington/ Barrington	North Barrington	IM,F,E	0.005	0.004	–	0.004
M7	Oakbrook Estate	None	SE McHenry Co./ None	Cary	AD,L,E	0.100	0.005	–	0.005
L29	Quaker Oats	None	Barrington/ Barrington	Barrington	L,E	0.0125	0.0125	–	0.0125
K10	Riverwood Estates M.H.P.	0049280	SE McHenry Co./ None	Algonquin		0.060		–	
L30	Rosewood Apartments	0048194	NW Lake/LCDPW	Round Lake	AD,F,E			–	
C29	Safety Kleen Corp.	None	Elgin/Elgin SD	Elgin	IS			–	
M9	Shagbark	None	None	Hebron	AD,FB			–	
C30	Springlakes MHP	0050369	Elgin/Elgin SD	Bartlett	A,F,E	0.030	0.040	–	0.040
M10	Sun Electric	None	McHenry/McHenry	Prairie Grove	A,L,E,IM	0.025		–	

(1) See key

TABLE 19-21 A: MISCELLANEOUS WASTEWATER TREATMENT PLANTS FOX RIVER BASIN

MAP CODE	FACILITY NAME	NPDES PERMIT NUMBER	FACILITY PLANNING AREA / LEAD AGENCY	NEAREST MUNICIPALITY	TREATMENT UNITS(1)	WASTEWATER LOADS MGD			
						CURRENT		1985	2000
						DESIGN CAPACITY	1975 LOAD		
M11	Terra Cotta Realty Co.	0038202	McHenry/McHenry	Prairie Grove	AC,F,E	0.100	0.100	-	0.100
L32	Travenol Labs	0024074	NW Lake/LCDPW	Round Lake	A,L,E				
M12	Camp Algonquin	0031917	SE McHenry Co./ None	Algonquin	S,F,E	0.007		-	
M13	Valley High Nursing Home	0050326	None	Woodstock	S,L	0.100	0.080	-	0.080
M14	Wallens, Harry Subdivision	None	SE McHenry Co./ None	Crystal Lake	AD,L	0.0024	0.001	-	0.001
K11	Waubonsee Comm. College	0038229	None	Sugar Grove	A,L,E	0.062		-	
D24	Wayne Grade School	0034843	Wayne/Wayne	Wayne	AD,L,E	0.030	0.0064	-	0.0064

(1): Activated sludge (A); contact stabilization (AC); extended aeration (AD); chlorination (E); tertiary filter (F); buried sand filter (FB); trickling filter(s) (FT); Imhoff tank (IM); subsurface application (IS); special treatment (K); tertiary lagoon (L); stormwater holding (LM); septic (S).

(1) See key

TABLE 19-21 B: MISCELLANEOUS WASTEWATER TREATMENT PLANTS

FOX RIVER BASIN

MAP CODE	RECEIVING STREAM			NPDES PERMIT DATES		EFFLUENT REQUIREMENTS (mg/l)								COMMENTS
	NAME	7 DAY-10 YR. LOW FLOW (MGD)				1976[(1)]				2000				
		1970	2000	ISSUED	EXPIRES	BOD	TSS	P	NH_3-N	BOD	TSS	P	NH_3-N	
L1	Cedar Lake	0												
L4	Flint Creek	1.55		3-22-76	12-31-79	30	30							
K1	ditch to Blackberry Ck	0		Draft	5-31-82	4	5							
L5	Squaw Creek	0		5-30-75	12-31-79	4	5	1						Summer Discharge Only
L6	Loon Lake	0		6-9-75	12-31-79	4	5							
M2	Pistakee Bay			5-28-76	12-31-79	4	5							
L7	None													Land Application
D10	Indian Creek	0		1-21-74	1-10-79	30	30							
K3	Blackberry Ck	0.13		10-6-76	12-31-79	30	30							
L11	Squaw Creek	0		6-18-75	12-31-79	4	5							
M3	Subsurface													Subsurface
L14	Squaw Creek	0		6-18-75	10-1-79	4	5							
L16	Wooster Lake	0		Draft	2-1-82	4	5							
K5	ditch to Fox River	0		Draft	9-30-80	4	5							
K6	Mill Creek	0		Draft	11-30-81	4	5							
K7	East Br. of Big Rock Creek	0		6-9-75	12-31-79	10	12							
L21	ditch to Squaw Creek	0		Draft	8-1-81	4	5							

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(1) From NPDES Permits

TABLE 19-21 B: MISCELLANEOUS WASTEWATER TREATMENT PLANTS — FOX RIVER BASIN

MAP CODE	RECEIVING STREAM			NPDES PERMIT DATES		EFFLUENT REQUIREMENTS (mg/l)								COMMENTS
	NAME	7 DAY - 10 YR. LOW FLOW (MGD)				1976[1]				2000				
		1970	2000	ISSUED	EXPIRES	BOD	TSS	P	NH_3-N	BOD	TSS	P	NH_3-N	
L22	drainage tile to Fish Lake	0		5-22-75	6-30-79	4	5							
D13	Waubansee Ck	0		4-30-75	8-1-75									Will divert to Naperville
M4	Subsurface													Subsurface
M5	Ditch to Dutch Creek	0		5-21-75	5-31-79	10	12							
K8	Fox River	61.4		3-27-75	7-31-77	30	30							
L26	Flint Creek	0		6-9-75	12-31-79	4	5							
K9	drainage tile to Mill Creek	0		5-27-75	4-30-79	4	5							
M6	Subsurface													Subsurface
L27	ditch to Flint Creek	0		6-9-75	12-31-79	4	5							
M7	Pond	0												No surface discharge
L29	None													Spray Irrigation
K10	Fox River			9-27-76	12-31-78	10	12							
L30	Squaw Creek	0.10		8-8-75	12-31-78									Under construction
C29														
M9	Subsurface													Subsurface
C30														
M10	Subsurface													Subsurface

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(1) From NPDES Permits

TABLE 19-21 B: MISCELLANEOUS WASTEWATER TREATMENT PLANTS

FOX RIVER BASIN.

MAP CODE	RECEIVING STREAM			NPDES PERMIT DATES		EFFLUENT REQUIREMENTS (mg/l)								COMMENTS
	NAME	7 DAY-10 YR. LOW FLOW (MGD)				1976(1)				2000				
		1970	2000	ISSUED	EXPIRES	BOD	TSS	P	NH_3-N	BOD	TSS	P	NH_3-N	
M11	Squaw Creek	0.65		6-9-75	12-31-79	4	5							
L32	ditch to Lure Lake	0		3-13-75	12-31-79	10	12							
M12	Fox River	33.3		4-2-76	12-31-79	30	30							
M13	Tile to South Br. of Nippersink Creek	0		3-14-77	9-30-81	4	5							
M14	Subsurface													Subsurface
K11	ditch to Blackberry Ck	0		6-9-75	12-31-79	10	12							
D24	tile to Norton Creek	0		6-9-75	12-31-79	4	5							

(1) From NPDES Permits

TABLE 19-22 A: OTHER POINT SOURCE DISCHARGES FOX RIVER BASIN

MAP CODE	FACILITY NAME	NPDES PERMIT NUMBER	FACILITY PLANNING AREA / LEAD AGENCY	LOCATION AND NEAREST MUNICIPALITY	FLOW (MGD) 1976	NPDES PERMIT DATES	
						ISSUED	EXPIRES
K1	All Steel Inc.	0054780	Aurora/Aurora SD	Montgomery	0.190	12-7-76	1-1-81
L2	American Can Co.	0035165	Barrington/Barrington	Barrington	0.750	6-30-75	5-31-80
K2	Armour Dial, Inc	001899	Aurora/Aurora SD	Montgomery	0.650	5-27-75	3-31-79
D5	Morse Chain Borg-Warner	0032174	Aurora/Aurora SD	Aurora	0.030	11-27-74	5-31-79
K3	Burd, Inc.	0002143	Eastern Kane/ St. Charles	St. Charles		6-19-75	12-31-78
K4	Burgess Norton #1	0036331	Eastern Kane/ St. Charles	Geneva	0.050	1-27-75	6-1-79
K5	Burgess Norton #2	0049221	Eastern Kane/ St. Charles	Geneva	0.070	4-6-76	12-31-78
K6	Burlington Northern RR	0037648	Aurora/Aurora SD	Aurora		5-28-75	7-1-79
K7	Burlington Northern #001	0037656	Aurora/Aurora SD	Eola	0.0072	4-30-75	6-1-79
K7	Burlington Northern #002	0037656	Aurora/Aurora SD	Eola	0.024	4-30-75	6-1-79
K9	Chicago Gravel Hammond-Elgin	0032166	Elgin/Elgin SD	Elgin		4-4-75	8-31-79
K10	Chgo. Milwaukee, St. Paul, Pac. RR	0035769	Elgin/Elgin SD	Elgin		5-10-77	11-30-81
K11	Chicago Rawhide	0035530	Elgin/Elgin SD	Elgin	0.150	1-22-75	5-1-79
K12	Conco-Western Stone	0026760	Aurora/Aurora SD	North Aurora		7-18-74	12-31-78

TABLE 19-22 A: OTHER POINT SOURCE DISCHARGES FOX RIVER BASIN

MAP CODE	FACILITY NAME	NPDES PERMIT NUMBER	FACILITY PLANNING AREA / LEAD AGENCY	LOCATION AND NEAREST MUNICIPALITY	FLOW (MGD) 1976	NPDES PERMIT DATES	
						ISSUED	EXPIRES
K13	Consolidated Freightways	0049999	Aurora/Aurora SD	Aurora	No current discharge	7-16-76	2-28-81
K14	Crichton's Inc.	0046531	South Dundee/ West Dundee	West Dundee	0.002	6-6-75	4-30-80
K15	Dart Container Corp.	0051381	Aurora/Aurora SD	North Aurora		5-6-77	1-31-82
K16	DuKane Corp.	0024171	Eastern Kane/ St. Charles	St. Charles		3-24-75	7-1-79
K19	Felts Sand and Gravel	0025801	Aurora/Aurora SD	North Aurora		3-24-75	9-1-79
K20	Fox River Stone	0022900	Eastern Kane/ St. Charles	Valley View		3-13-75	9-1-79
K21	Goodrich,B.F.Co.	0033995	Eastern Kane/ St. Charles	St. Charles	0.011	12-10-74	8-31-79
M1	Gordon Co.	0036650	Richmond/Richmond	Richmond	0.004	6-23-75	3-31-80
K22	Head Inc.	0047228	Elgin/Elgin SD	Elgin	0.007	4-15-75	4-30-78
K23	Hoffer Plastics North	0004979	Eastern Kane/ St. Charles	Valley View	0.100	1-4-74	10-1-78
K24	Hoffer Plastics South	0004961	Eastern Kane/ St. Charles	Valley View	0.035	2-8-74	12-31-78
L17	Jewel Co., Inc.	0005100	Barrington/ Barrington	Barrington	0.120	10-11-74	3-31-79
L18	Kendall Co. Research	0002500	Barrington/ Barrington	Barrington	0.004	5-9-74	11-30-78
K27	Lyons Metals	0001686	Aurora/Aurora SD	Montgomery	0.058	1-7-74	7-1-78

TABLE 19-22 A: OTHER POINT SOURCE DISCHARGES

FOX RIVER BASIN

MAP CODE	FACILITY NAME	NPDES PERMIT NUMBER	FACILITY PLANNING AREA / LEAD AGENCY	LOCATION AND NEAREST MUNICIPALITY	FLOW (MGD) 1976	NPDES PERMIT DATES	
						ISSUED	EXPIRES
M4	McGraw-Edison	0035190	SE McHenry County/ None	Algonquin	0.0215	1-31-75	2-1-79
M-5	McHenry Sand & Gravel	0025640	Island Lake-Lakemoor/ Island Lake S.D.	Lakemoor		4-17-75	9-1-79
K28	McWhorter Chem#001-002	0035203	Carpentersville/ Carpentersville	Carpentersville	0.012	2-2-75	7-31-79
K29	Meyer Material Co.	0024252	None	Sugar Grove	0.100	1-31-75	4-30-79
K30	Moline Malleable Iron Co.	0002810	Eastern/Kane/ St. Charles	St. Charles	0.012	9-30-74	12-31-77
M6	Morton Chemical Co.	0001716	McHenry/McHenry	McCullom Lake	0.440	4-17-75	9-30-78
K32	National Electronics #002-003	0024333	None	Geneva	0.006	5-27-75	4-30-79
K33	Northern Ill.Gas Co.	0050067	Various	Various		7-29-76	3-31-81
K34	Purex Corp.	0001821	Eastern/Kane/ St. Charles	Geneva	0.050	1-22-75	6-1-79
L22	Quaker Ind.	0037842	NW Lake/LCDPW	Antioch	0.070	5-28-75	12-31-79
C113	Quaker Oats Research Lab	0001473	MSDGC/MSDGC	Barrington	0.265		
M7	Repco Enterprises	0034266	Richmond/Richmond	Richmond	0.006	6-27-77	5-30-82
K35	Sperry,D.R.Co.	0046442	Aurora/Aurora SD	Aurora	0.0003	6-11-75	4-30-80
K36	St.Charles Mfg	0004885	Eastern/Kane/ St. Charles	St. Charles	0.012	6-13-75	4-30-80

TABLE 19-22 A: OTHER POINT SOURCE DISCHARGES FOX RIVER BASIN

MAP CODE	FACILITY NAME	NPDES PERMIT NUMBER	FACILITY PLANNING AREA / LEAD AGENCY	LOCATION AND NEAREST MUNICIPALITY	FLOW (MGD) 1976	NPDES PERMIT DATES	
						ISSUED	EXPIRES
K37	Star Mfg. Star Forge Div.	0050504	Carpentersville/ Carpentersville	Carpentersville	0.060	11-3-76	3-3-81
M9	T-C Industries East	0026816	McHenry/McHenry	Prairie Grove	0.090	1-31-75	5-31-79
M9	T-C Industries West	0026816	McHenry/McHenry	Prairie Grove	0.070	1-31-75	5-31-79
K38	Western Electric Co.	0002321	Aurora/Aurora S.D.	Montgomery	0.060	12-1-74	6-1-79
K39	Woodruff and Edwards	0035815	Elgin/Elgin S.D.	Elgin		3-31-75	12-31-78
M10	Woodstock Die Cast #002	0033863	Woodstock/Woodstock	Woodstock	0.650	6-30-75	3-31-78
K8	Carpentersville Water Plant	0046434	Carpentersville/ Carpentersville	Carpentersville		1-7-76	12-31-78
K17	Elburn Water Plt	0051594	Elburn/Elburn	Elburn		6-14-76	12-31-79
K18	Elgin Water Plt	0047538	Elgin/Elgin S.D.	Elgin		6-20-75	12-31-78
K25	State Boys Sch. Water Plt.	None	None	St. Charles			
K26	Rollins S&W Water Plant	0045322	Elgin/Elgin S.D.	Elgin			
M3	Hillview Farm	0047813	Spring Grove/ Sunnyside	Richmond Township (T46N,R8E) NE 1/4 of Sec. 15-Richmond	overflow		
K31	Muetze, William Feedlot	0035323	None	Batavia Township (T39N, R8E) W 1/2 of sec. 19-Batavia	overflow	9-11-74	10-10-79
M8	Shamrock Beef Farm	0035599	McHenry/McHenry	McHenry Township (T45N, R8E) Sec. 32 - McHenry	overflow	7-8-74	6-26-79

TABLE 19-22 B: OTHER POINT SOURCE DISCHARGES FOX RIVER BASIN

MAP CODE	RECEIVING STREAM			EFFLUENT REQUIREMENTS[1] (mg/l)	COMMENTS
	NAME	7 DAY - 10 YR. LOW FLOW (MGD)			
		1970	2000		
K1	Storm sewer to Gillette Ck	0		Temp.	
L2	Storm sewer to Jewel Lake	0		Temp. 750 TDS	Non-contact cooling water
K2	Storm sewer to Mill Ck	0		Temp. 750 TDS, 15 TSS	Cooling water
D5	ditch to Selmarton Ck	0		Temp.	Cooling water
K3	Fox River	50.4		Temp.,750 TDS, Daily Max (DM); 15 TSS, 15 oil and grease (o/g), 2 (tot) Fe	
K4	Storm sewer to Fox River	0		Temp., 15 TSS, 15 o/g	
K5	Storm sewer to Mill Ck	0		4 BOD, 5 TSS	
K6	Storm sewer to Indian Ck	0		15 (DM) TSS	
K7	ditch to Indian Ck	0		15 (DM) TSS, 15 (DM) o/g	Cooling and Storm water
K7	Indian Ck	0		Temp., 750 TDS	Cooling and Storm water
K9	Popular Ck	0.65		15 (DM) TSS	
K10	Fox River			15 o/g	
K11	Tyler Ck	0.21		Temp.,10BOD,12 TSS, 750 TDS, 15(DM) o/g	
K12	ditch to Fox River	0		20 TSS	

(1) From NPDES Permits

TABLE 19-22 B: OTHER POINT SOURCE DISCHARGES FOX RIVER BASIN

MAP CODE	RECEIVING STREAM			EFFLUENT REQUIREMENTS[1] (mg/l)	COMMENTS
	NAME	7 DAY - 10 YR. LOW FLOW (MGD)			
		1970	2000		
K13	Natural Ck	0		15 TSS, 15 o/g	
K14	ditch to Fox River	0		Temp., 15 (DM) o/g	Cooling water
K15	Springbrook Creek	0		Temp., 15 (DM) TSS, 15(DM) o/g,3500 (DM) TDS	
K16	ditch to Fox Creek	0		Temp., 15 TSS, 750 TDS	Cooling water
K19	ditch to Fox River	0		20 TSS	
K20	ditch to Fox River	0		20 TSS	
K21	ditch to Fox River	0		Temp., 750 TDS	Cooling water
M1	Swamp to No. Branch of Nippersink Ck	0		Temp., 15 TSS	
K22	Fox River			Temp.	
K23	Fox River	42.6		15 (DM) TSS, 5 o/g	Cooling water
K24	Storm sewer to Fox River	42.6		15 TSS, 15 o/g	Cooling water
L17	Jewel Lake	0.97		Temp	Cooling water
L18	Storm sewer to Jewel Lake	0		Monitoring required only	Cooling water
K27	Lower Turkey Ck	0		Monitoring requirements only	Cooling water

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(1) From NPDES Permits

TABLE 19-22 B: OTHER POINT SOURCE DISCHARGES FOX RIVER BASIN

MAP CODE	RECEIVING STREAM			EFFLUENT REQUIREMENTS[1] (mg/l)	COMMENTS
	NAME	7 DAY-10 YR. LOW FLOW (MGD)			
		1970	2000		
M4	Crystal Lake	2.2		750 (DM) TDS	Cooling water
M5	ditch to Lake Defiance	0		15 (DM) TSS	
K28	Fox River	36.5		Temp., 750 TDS	Cooling water
K29	ditch to Big Rock Ck	0		20 TSS	
K30	ditch to Fox River	0		Temp., 750 TDS, 10 o/g, 15 (DM) TSS	Cooling and process water
M6	Dutch Creek	0		15 TSS, 750 TDS, 1.5 NH_3-N	Cooling and process water
K32	Mill Creek North	0		Temp	Cooling water
K33	Waters of the State			Monitoring for iron, oil/grease,hexane solubles	Gas line testing throughout Illinois
K34	ditch to Fox River	0		Temp., TDS	Cooling water
L22	Sequoit Ck	0		Temp., Daily Max; 15 TSS, 15 o/g	Cooling water
C113	ditch to Flynn Ck	0		Temp	Cooling water
M7	Slough to No. Branch of Nippersink Ck	3.36		Daily Max; 15 TSS, 15 o/g, 1 (tot) Fe	
K35	Fox River	62.1		Temp.	Cooling water
K36	ditch to Fox River	0		Temp., 750 TDS	Cooling water

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(1) From NPDES Permits

TABLE 19-22 B: OTHER POINT SOURCE DISCHARGES FOX RIVER BASIN

MAP CODE	RECEIVING STREAM			EFFLUENT REQUIREMENTS(1) (mg/l)	COMMENTS
	NAME	7 DAY - 10 YR. LOW FLOW (MGD)			
		1970	2000		
K37	Fox River			15 (DM) TSS	
M9	Squaw Creek	0		Monitoring requirements only	Cooling water
M9	Squaw Creek	0		Monitoring requirements only	Cooling water
K38	Storm sewer to Fox River	68.5			Cooling water
K39	Fox River			Temp., 15 (DM) TSS, 2 (tot) Fe	Cooling water
M10	Storm sewer to So. Branch Nippersink Ck	0		Temp.	Cooling water
K8	ditch to Fox River	0		Monitoring requirements only	
K17	ditch to Blackberry Ck	0		Monitoring requirements only	
K18	Fox River	40.7		Monitoring requirements only	
K25	Mill Creek				
K26	ditch to Fox River	0		Monitoring requirements only	
M3	Land Application			Permit not required for current operations	
K31	ditch to Lake Run	0		There can be no discharge of pesticides, hazardous substances or toxic pollutants	
M8	ditch to Boone Creek	0		There can be no discharge of pesticides, hazardous substances or toxic pollutants	

(1) From NPDES Permits

e. Combined Sewer Overflows

Combined sewer systems are utilized in the city of Batavia and in the Sanitary District of Elgin and the Aurora Sanitary District. It is estimated that 11.7 square miles of the basin are served by combined sewer overflows.

f. Local Facilities Planning

Future water quality in the basin will be influenced by the facilities planning efforts of 26 FPAs, as well as the MSDGC and non-FPA areas. In addition, portions of the Northeast Central Lake, Bartlett, and West Chicago FPA are in the basin, but these areas are either sewered to other basins or are not expected to have wastewater service before the year 2000. Figure 19-6 shows the FPAs and present and projected wastewater service areas.

Southeastern McHenry FPA

There are six municipal type wastewater treatment plants in the Southeastern McHenry FPA. Crystal Lake owns and operates three plants. Algonquin and Cary also own and operate their own facilities. The Turnberry Utility Company operates a facility in the FPA which discharges to the Kishwaukee River. Information on that plant may be found in Chapter Fourteen.

The wastewater needs analysis for the Southeastern McHenry FPA called for the FPA to be split into three sub-FPAs: Algonquin; Cary-Oakwood Hills; and Crystal Lake-Lakewood. Algonquin would expand its existing plant to 2.12 mgd by 1985 to serve future growth to the year 2000. The Cary-Oakwood Hills sub-FPA plan recommended expansion of the Cary plant to 2.77 mgd by 1986 to serve Cary's future growth. Oakwood Hills would remain on septic systems until such time as citizens wished to construct a sewer system. The consultant determined that if Oakwood Hills constructed a sewer system, it would be cheaper to pump wastewater to Cary for treatment than to construct a separate treatment plant for Oakwood Hills.

The recommended plan for the Crystal Lake-Lakewood sub-FPA suggests that Crystal Lake expand its plant No. 2 to 6 mgd in 1985, its plant No. 3 to 2 mgd in 1990, and consider phasing out plant No. 1 if a Step 1 study proves that it would be uneconomical to repair and upgrade it. The sewer system would be extended as necessary to serve future development. Lakewood would continue to be served by Crystal Lake.

Northwest Lake FPA

There are five municipal type wastewater treatment plants in the Northwest Lake FPA. Facilities are owned and operated by Antioch, Fox Lake, the Fox Lake Utility Company, Lake Villa, and the Round Lake Sanitary District.

Figure 19-4: POINT SOURCE DISCHARGES

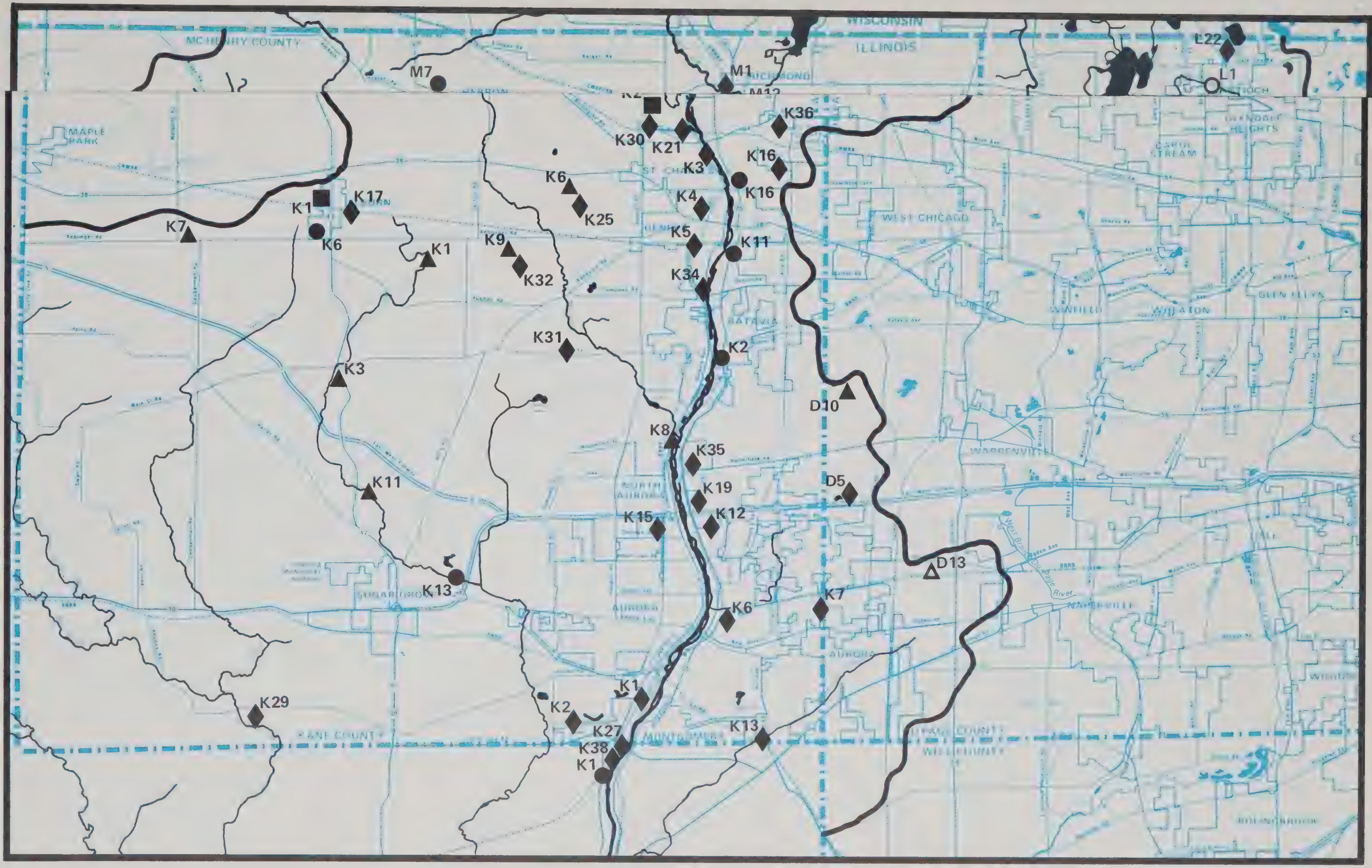
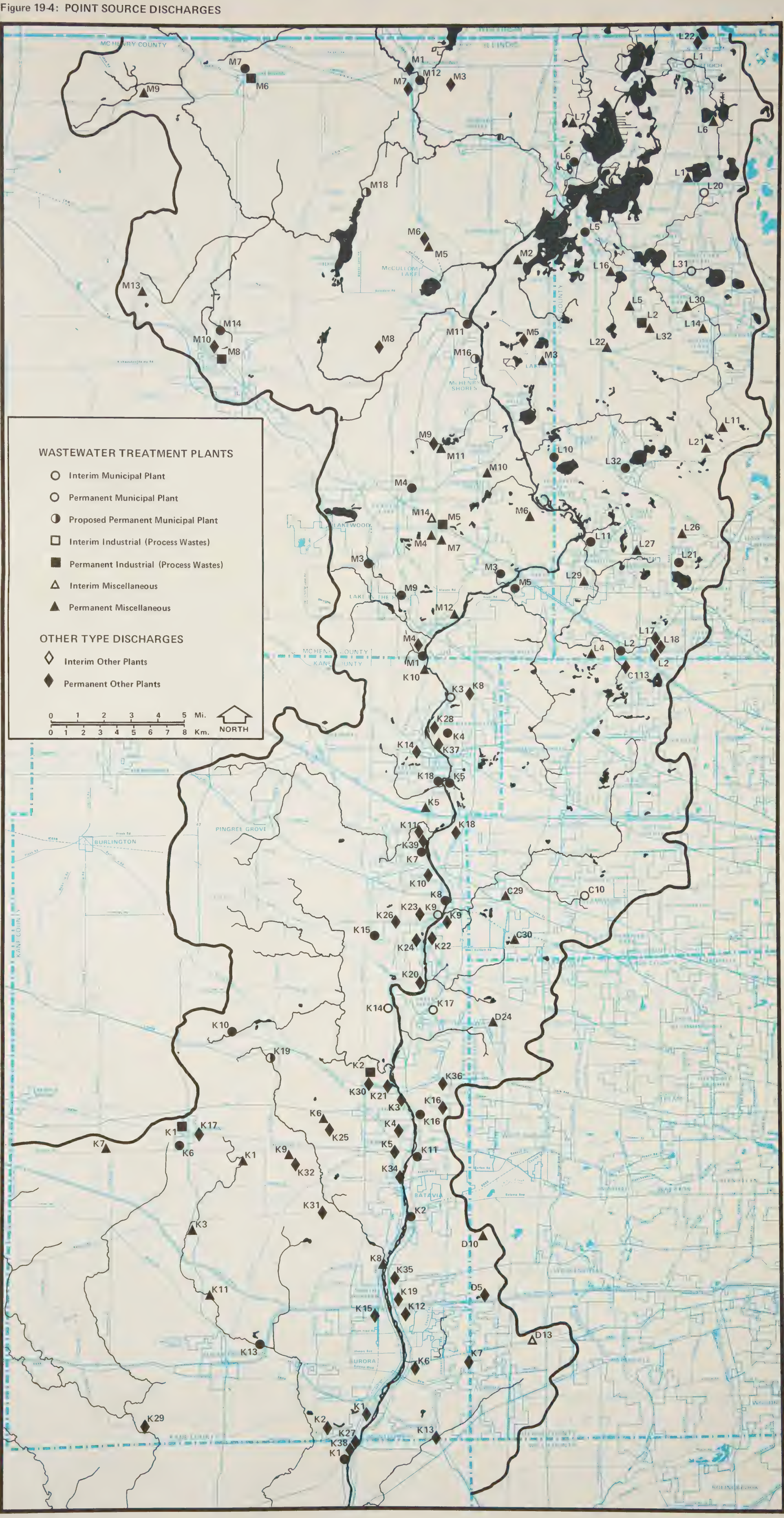


Figure 19-4: POINT SOURCE DISCHARGES



The approved facilities plan, dated April 1975, calls for a 6 mgd regional wastewater treatment plant at Fox Lake. A series of regional interceptors are to be constructed to phase out the Antioch, Lake Villa, and Round Lake Sanitary District plants.

Phase I of the work involves serve to Fox Lake, and three sanitary districts: Round Lake, Fox Lake Hills, and Lakes Region. The latter two presently have no facilities. Adjacent unincorporated areas will also be served. Phase II involves service to Antioch and areas between Petite Lake and Grass Lake (probably by 1990) and expansion of the Fox Lake plant to 12 mgd. Phase III involves service to Lake Villa (probably by 1995).

Barrington FPA

There are two municipal type wastewater treatment plants in the Barrington FPA, one owned and operated by the Village of Barrington, the other by the Lake Barrington Homeowners Association. A facilities plan has been completed for the Barrington FPA which calls for the expansion and upgrading of the Barrington facility, from 2 mgd to 3.68 mgd by 1980. The Lake Barrington Homeowner's Association plant is expected to remain in operation.

Batavia FPA

The City of Batavia owns and operates the only municipal type wastewater treatment plant in the Batavia FPA. Batavia also has three overflows from a section of combined sewers serving an area of approximately 310 acres and 4,760 people in the city. A facilities plan has been completed for the Batavia FPA and approved by the IEPA. This plan calls for expansion of the Batavia plant from 2.72 mgd to 5.2 mgd average capacity and 12.9 mgd maximum capacity. The combined sewer system would be partially separated by additional new interceptors, and another series of interceptors would be constructed to route flow from the combined sewer diversion chambers to the plant. At the plant, a 2.5-million-gallon equalization basin would level peak flows so that all wastewater could be routed through the plant for secondary treatment. This system would be able to handle flows from the 5-year 24-hour rainfall event. Flows in excess of this would receive only primary treatment and disinfection.

Aurora FPA

The Aurora Sanitary District wastewater treatment facility is the only municipal type plant in the Aurora FPA discharging within the Fox River basin. The Aurora Sanitary District also operates 18 potential bypasses and overflows to the Fox River from its combined sewers serving an area of 4,360 acres. A facilities plan has been completed for the Aurora FPA, but to date it has not been certified by IEPA or USEPA. The facilities plan calls for expansion of the Aurora S.D. plant in two phases.

Phase I calls for construction of structures to increase the 32 mgd plant to 50 mgd. However, equipment for only 8 mgd expansion would be installed, giving the plant a balanced capacity of 40 mgd. Phase II calls for the installation of the remaining 10 mgd of equipment to give the plant a total capacity of 50 mgd. Phase I work is estimated to be completed by 1980. Implementation of Phase II will be as necessary. Additional construction on the Waubonsie interceptor and construction of an Oswego interceptor is also planned.

The Aurora Sanitary District proposes to provide flow-through treatment for combined sewer flows up to 10 times the average dry weather flow of 5.1 mgd. Primary treatment and disinfection would be provided at three sites along the Fox River.

Elburn FPA

The Village of Elburn's wastewater treatment facility is the only municipal type plant in the Elburn FPA. A facilities plan has been completed and approved for the Elburn FPA which calls for the construction of a new 1.27 mgd plant to replace the existing .11 mgd plant. Service would be extended to the Kaneland School and E.W. Kneip Company to phase out wastewater treatment facilities at those sites. Construction of the new plant should be completed by 1980.

Sanitary District of Elgin FPA

There are six municipal type wastewater treatment facilities in the Sanitary District of Elgin (SDE) FPA. The SDE operates three facilities: a north plant, a main plant, and a west plant. The MSDGC owns the now defunct Streamwood facility. The remaining two facilities are owned and operated by the St. Charles Skyline Sewer and Water Company and the Rollins Sewer and Water Company. The SDE also operates 13 combined sewer overflow discharges to the Fox River. A facilities plan has been completed for the SDE FPA and the Valley View sub-FPA, but it has not yet been approved by the IEPA and USEPA. The SDE plan recommends a three-phase program for wastewater collection and treatment improvements.

Phase I, which is already under construction, calls for the expansion of the SDE main plant from 8.6 mgd to 17 mgd. This construction should be completed in 1979. The MSDGC Streamwood plant completed phase-out to the SDE main plant in late 1977. Phase II calls for the 1990 construction of interceptors to allow the phase-out of the SDE west side plant and the Rollins Sewer and Water Company plant. The SDE main plant would also be expanded from 17 mgd to 25 mgd. Phase III calls for the year 2000 expansion of the SDE main plant to 35 mgd.

Plans have also been formulated for expansion of the SDE north plant from 3.5 mgd to 6 mgd and for the treatment of combined sewer overflows. The SDE has recommended that combined sewer overflows be collected for treatment at the site of the SDE west side plant. The existing plant facilities and new facilities would be utilized to provide primary treatment and disinfection for flows between 2½ and 32½ times average dry weather wastewater flows from the SDE. Flows below 2½ times average dry weather flows would

Figure 19-5: WASTEWATER SERVICE AREAS

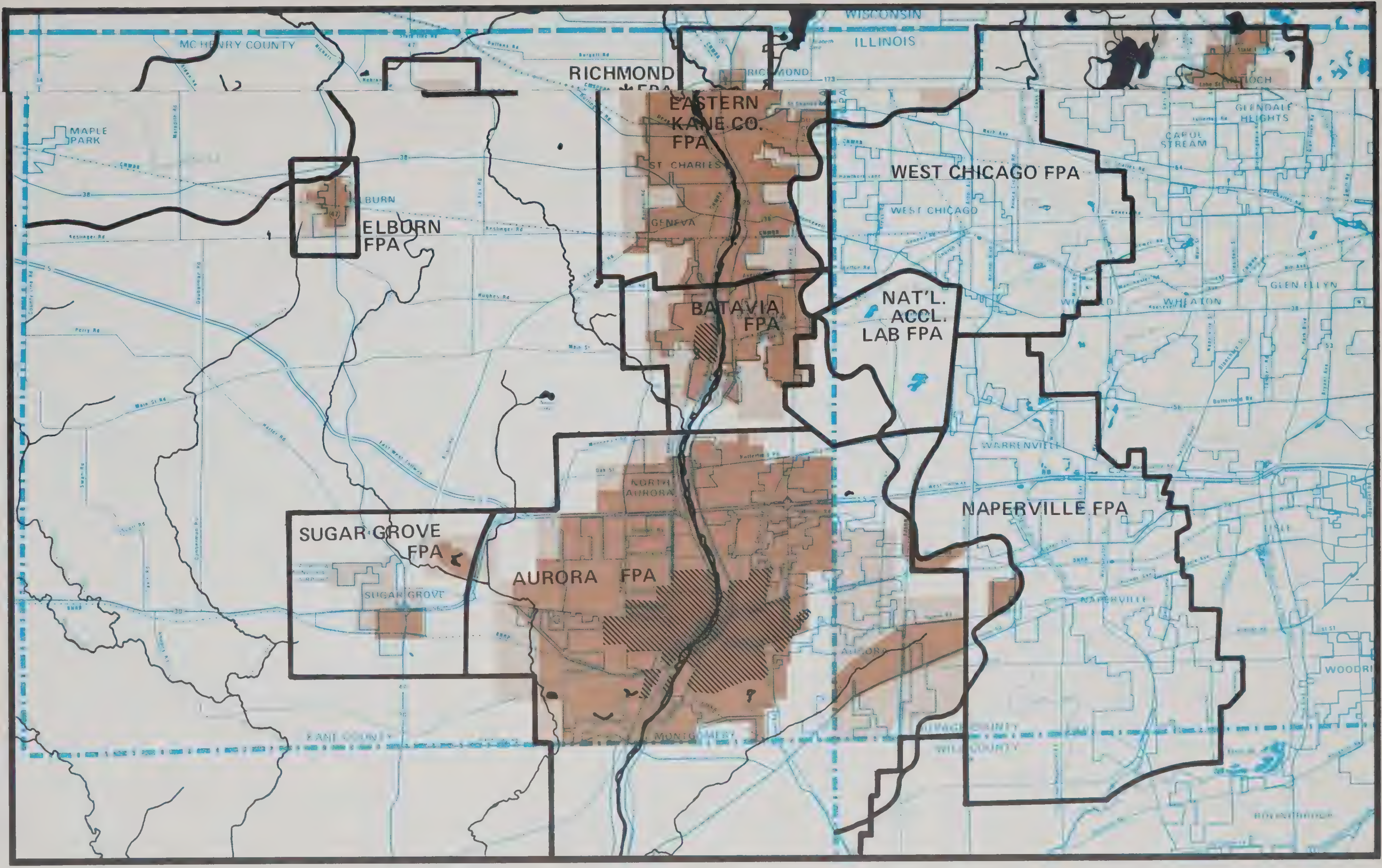
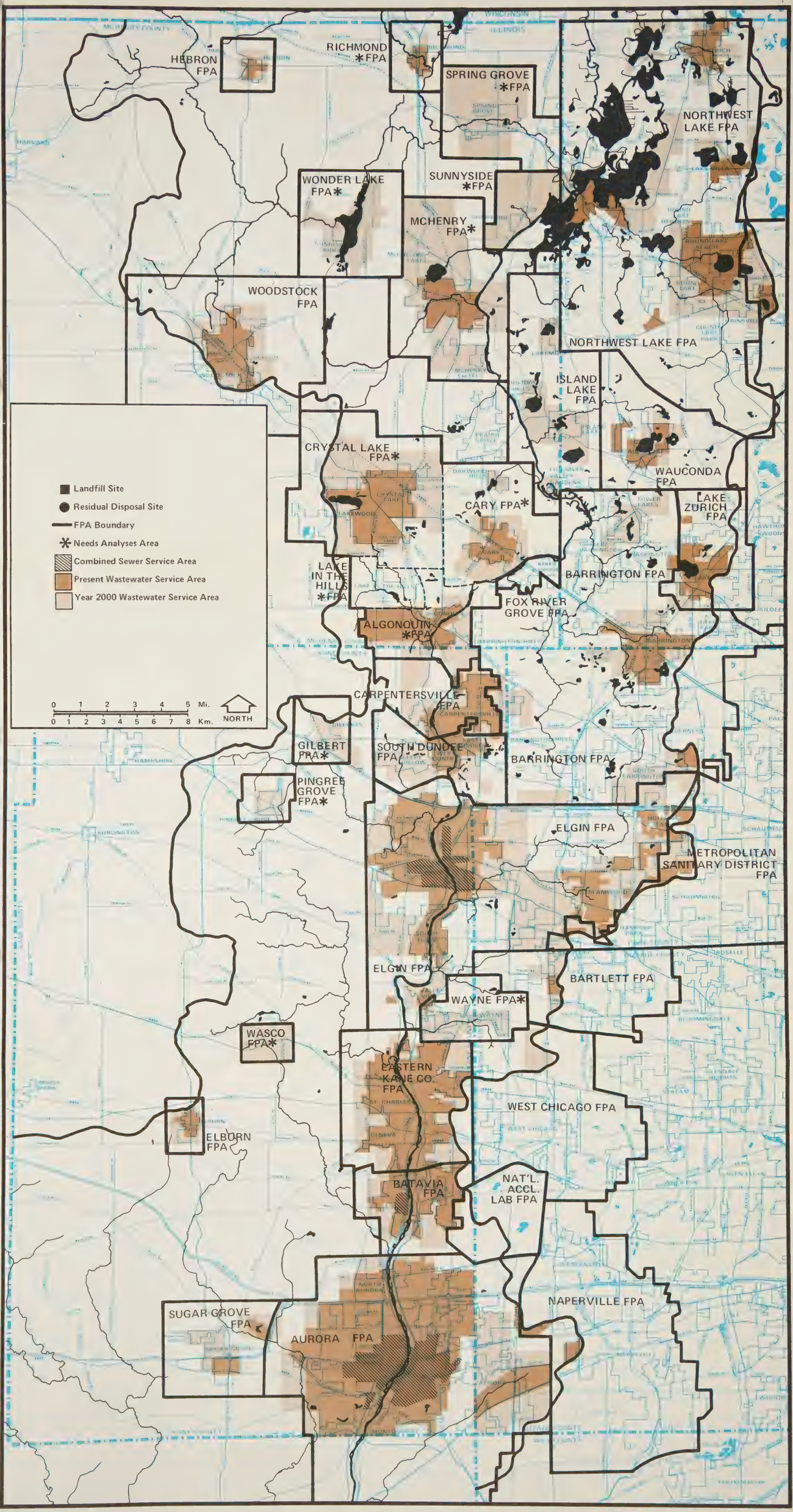


Figure 19-5: WASTEWATER SERVICE AREAS



receive secondary treatment at the other SDE facilities, and flows in excess of 32½ times average dry weather flow would be discharged without treatment to the Fox River. The date of implementation of these projects is dependent upon funding.

Plans for the Valley View sub-FPA recommend the construction by 1980 of a pumping station and force main to the SDE main plant to serve the Valley View area and allow the phase-out of the St. Charles Skyline Sewer and Water Company. This station would be enlarged as necessary, probably in 1990.

Fox River Grove FPA

The only municipal type wastewater treatment plant in the Fox River Grove FPA is owned and operated by the Village of Fox River Grove. A facilities plan has been completed and approved for the Fox River Grove FPA. This plan calls for the expansion of the existing Fox River Grove plant from .39 mgd to 1.25 mgd by 1980.

Eastern Kane County FPA

There are three municipal type plants in the Eastern Kane County FPA. The cities of Geneva and St. Charles each own and operate wastewater treatment facilities. The third plant is operated by the River Grange Lakes Utility Company. Facilities planning has recently been initiated for the FPA and to date no conclusions have been reached. However, based on the existing capacity of the Geneva and St. Charles plants and the projected future growth for these cities, no future plant expansion is likely.

Hebron FPA

The Village of Hebron owns and operates the only municipal type plant in the Hebron FPA. A facilities plan has been completed and approved for the Hebron FPA which recommends expansion and upgrading of Hebron's wastewater facilities from .11 mgd to .19 mgd by 1980. The plant would treat flows from the Kenosha Packing Company in addition to the municipal wastewater of Hebron.

Island Lake and Lakemoor FPAs

There presently are no municipal type wastewater treatment facilities in either the Island Lake or Lakemoor FPAs. A facilities plan has been completed and approved for the FPA which calls for the construction of a new 1.2 mgd Island Lake Sanitary District plant to serve the villages of Island Lake and Lakemoor and their surrounding unincorporated areas. Construction should be completed by 1980.

Lake in the Hills FPA

The Lake in the Hills Sanitary District wastewater treatment facility is the only municipal type plant in the Lake in the Hills FPA. A facilities plan has been completed and approved for the FPA which recommends expansion and upgrading of the present .25 mgd plant to .85 mgd. Construction should be completed by 1980.

Lake Zurich FPA

The only municipal type plant in the Lake Zurich FPA discharging to the Fox River is the Lake Zurich northwest wastewater treatment facility. A facilities plan has been prepared for the service area of this northwest plant which recommends retention of this plant as a separate facility with possible expansion in 1985. Future planning activities for the service area of the Lake Zurich southeast plant may alter this conclusion and recommend a regional facility for the FPA. However, in the absence of such information, it was assumed this facility will exist in the Lake Zurich FPA through the year 2000.

McHenry FPA

The City of McHenry owns and operates the only municipal type wastewater treatment plant in the McHenry FPA. The McHenry FPA needs analysis report recommended that McCullom Lake construct a sewer collection system to be served by an interceptor extended from the McHenry sewer system and that McHenry Shores construct a sewer collection system and a new .25 mgd interim sewage treatment plant. It was suggested that both of these projects be implemented as soon as possible, perhaps by 1980. The report also recommended that McHenry expand its plant to 3 mgd at the existing site, probably by 1985. The report further suggests that, in 1985, the wastewater needs of the area be reexamined to determine whether the McHenry Shores plant should be expanded to a regional facility, or whether a new regional plant should be constructed on the east side of the Fox River and the McHenry Shores plant phased out. The new regional plant either at McHenry Shores or on the east side of the Fox River would have a capacity of 3.5 mgd, giving the McHenry FPA a total treatment capacity of 6.5 mgd.

Sugar Grove FPA

The Prestbury Utility Company wastewater treatment facility is the only municipal type plant in the FPA. The facilities plan for the Sugar Grove FPA calls for the construction of a new .3 mgd Sugar Grove wastewater treatment plant and the retention of the Prestbury wastewater treatment plant to treat excess flows. However, the alternatives calling for purchase and expansion of the Prestbury Utility Company plant and for service by the Aurora Sanitary District via a new interceptor are very close in terms of cost. To date a final decision on which alternative to implement has not been made.

Richmond FPA

The Village of Richmond owns and operates the only municipal type wastewater treatment facility in the Richmond FPA. The Richmond plant was upgraded and expanded in 1974. The needs analysis report for the FPA recommends that Richmond undertake an infiltration/inflow (I/I) study on the village's sewer system. The report also states that no expansion of the Richmond plant beyond its present .375 mgd capacity would be needed before the year 2000.

Wauconda FPA

The Village of Wauconda owns and operates the only municipal type wastewater treatment plant in the Wauconda FPA. A facilities plan has been completed for the FPA but has not yet been certified. The plan recommends upgrading and expanding the existing Wauconda plant from .8 mgd to 1.2 mgd. There are several significant issues which to date have not been resolved for the Wauconda FPA. Wauconda has applied for a variance from the Illinois Pollution Control Board (IPCB) to allow discharge to Bangs Lake Creek, which is tributary to Slocum Lake. The IEPA feels that Wauconda should build an outfall sewer around Slocum Lake to avoid discharge to that water body. Under the IEPA's suggestion, Wauconda would also need to obtain a Pfeffer exemption and to provide nitrification facilities at the upgraded plant. The resolution of these issues is dependent on the IPCB's ruling on Wauconda's variance request.

Woodstock FPA

The Woodstock North wastewater treatment facility, owned and operated by the City of Woodstock, is the only municipal type plant in the Woodstock FPA discharging to the Fox River basin. A facilities plan has been completed for the Woodstock FPA but has not been certified by IEPA or USEPA. The plan suggests that expansion of this facility (which was remodeled in 1976) will not be necessary before the year 2000.

Gilberts FPA

There are no municipal type plants in the Gilberts FPA. The Gilberts needs analysis report notes that the village would probably be unable to afford a sewage treatment and collection system. Unfortunately, Gilberts also faces the problem of soils unsuitable for on-site disposal by septics. The recommended plan calls for the continued decentralized treatment of wastewater within the Gilberts FPA. Treatment would be provided by septic systems in areas where they work properly. Nontraditional alternatives, such as mounded sand absorption fields, the partial sewering of problem areas to a community absorption field, or the partial sewering to holding tanks with trucking of sewage to a treatment plant would be considered in areas unsuitable for septics.

Spring Grove and Sunnyside FPAs

There are no municipal type plants in either the Spring Grove or Sunnyside FPAs. The needs analysis report for the Spring Grove and Sunnyside FPAs suggests that the most cost-effective sewage collection and treatment alternative would be to sewer both areas to the Fox Lake regional wastewater plant in Lake County. However, the cost of such a system would probably be out of reach of the residents of the FPAs. Therefore, the report recommends that Sunnyside and Spring Grove continue to operate septic systems where they function properly. It also suggests that Spring Grove construct partial sewer service in problem areas to a holding tank for transport to the Fox Lake plant for treatment. In areas unsuitable for septic tanks, Sunnyside could implement nontraditional alternatives, such as mounded sand absorption fields, partial sewering of problem areas to a community absorption field, or partial sewering to holding tanks with trucking of sewage to a treatment plant.

Wonder Lake FPA

There are no municipal type wastewater treatment plants in the Wonder Lake FPA. At present the entire FPA is served by septic systems which the needs analysis consultant feels are draining to Wonder Lake, causing a health and pollution hazard. The Wonder Lake needs analysis report recommends that a 1.04 mgd treatment facility be constructed by 1980 and have phosphorous removal and biological nitrification facilities to alleviate the hazards. The plan also calls for construction of an interceptor under the lake bed of Wonder Lake just off the east, south, and southwestern shorelines. Local collectors would also be constructed as necessary. Residents of the area have expressed a desire to remain on septics due to the financial burden of such a system, doubts about the pollutional impacts of septics on Wonder Lake, and doubts about the feasibility of the lake bed interceptor. It, therefore, appears likely that the Wonder Lake FPA will remain on septic systems. A supplemental study to determine the severity and location of septic problems around the lake should be implemented. Such a study could also recommend nontraditional on-site disposal techniques which could be effective in solving septic pollution problems.

Waso FPA

There are no municipal type wastewater treatment facilities in the Wasco FPA. The Wasco needs analysis report recommends construction of a sewage collection and treatment system with a design capacity of .1 mgd. The plant would be expanded as necessary to meet future growth. This plant would be constructed as soon as practicable by 1980.

Wayne FPA

There are presently no municipal type wastewater treatment plants in the Wayne FPA. The Wayne needs analysis report notes that the village would probably be unable to afford a sewage treatment and collection system. The recommended plan calls for the continued noncentralized treatment of wastewater within the Wayne FPA. This would be provided by septic systems in areas where they work properly. Non-traditional alternatives, such as mounded sand absorption fields, partial sewering of problem areas to a community absorption field, or partial sewering to holding tanks with trucking of sewage to a treatment plant would be considered in areas unsuitable for septics.

Burlington FPA

There presently are no municipal type wastewater treatment plants in the Burlington FPA. The Burlington needs analysis report recommended that septic systems continue to be used for wastewater treatment because of the expense of a centralized collection and treatment system. In areas where septic problems were noted, drainage improvements and mounded absorption septic systems were suggested as possible solutions.

Carpentersville FPA

The Village of Carpentersville owns and operates Main and Kimbal Hill wastewater treatment facilities, which are the only municipal type plants in the Carpentersville FPA. The village is presently completing expansion of the Main plant, from 3.5 mgd to 5 mgd under a facilities planning exemption. Further expansion to 7 mgd could be required by the year 2000, but no plans have been finalized. The village also plans to phase out the Kimbal Hill plant to the Main plant by 1980. An unresolved boundary dispute exists between the village of Carpentersville and the South Dundee FPA concerning wastewater service to portions of the Hill Nursery. Carpentersville intends to provide service to this area where a shopping center is planned. However, West Dundee has included it in the South Dundee FPA.

South Dundee Township FPA

There are two municipal type plants in the South Dundee Township FPA. Both the Village of East Dundee and the Village of West Dundee own and operate wastewater treatment facilities. A facilities plan has been completed for the South Dundee Township FPA but has not been certified. The plan calls for the villages of East Dundee and West Dundee to independently expand their plants to meet 1990 design loads. The East Dundee plant would expand to .967 mgd and the West Dundee plant would expand to .903 mgd. East Dundee would truck digested sludge in excess of present drying bed capacity to West Dundee for mechanical dewatering and ultimate disposal. A sludge transfer line would be constructed when it became cost-effective.

Both East Dundee and West Dundee would rehabilitate and expand their existing sewer systems, and Sleepy Hollow would construct a collection system and interceptor to the West Dundee plant. The Sleepy Hollow system would be phased to initially serve 636 village residents, with complete village service in about 10 years.

An unresolved boundary dispute exists between the South Dundee Township FPA and the Carpentersville FPA. This dispute is discussed in the narrative about the Carpentersville FPA.

Non-FPA Areas

The Ferson Creek Utility Company wastewater treatment facility is the only municipal type plant not located in an FPA in the Fox River basin. This privately owned facility is not projected to be in any other year 2000 service area.

Summary

The status of facilities planning and the future configuration of municipal type wastewater treatment facilities in the Fox basin is summarized in Tables 19-17a through 19-17e. Facilities planning efforts in this basin are nearing completion. However, there are still several FPAs with unresolved issues, and there are also many needs analysis reports requiring further study.

19.05 NONPOINT SOURCES: EXISTING CONDITIONS

a. Stormwater Sewer Systems

In the Fox basin, separate storm sewer systems serve all or portions of approximately 30 municipalities and numerous unincorporated areas. It is estimated that 48 square miles, or 5 percent of the basin area, are served by separate storm sewers. These systems follow natural drainage courses and discharge either directly into the Fox River or its tributaries or discharge indirectly via ditches or other small watercourses.

Combined sewer systems are present only in parts of Aurora, Batavia, and Elgin. It is estimated that 11.7 square miles, or 1 percent of the basin area, are tributary to combined sewer overflows. Areas of the basin not served by either separate storm sewers or combined sewer systems are estimated to comprise 900 square miles, or 94 percent of the basin area. Stormwater falling upon these areas enters the Fox River by overland flow via ditches or other small watercourses.

b. Construction Activities

As dicussed in Chapter Six, construction activities, coupled with stormwater runoff and resultant erosion, can contribute sediments, chemicals, and biological organisms to rivers and streams.

Basin data indicate that erosion associated with construction activity is occurring (or is expected to occur) in 56 acres located wholly or partially within the Fox River basin. The number of erosion areas by county is as follows:

Du Page	8
Kane	1
Lake	18
McHenry	29
	56

The areas total 14.2 square miles. Those identified by McHenry County are associated with roadbed construction and road reditching projects having a total approximate length of 18 miles. Erosion problems associated with reditching are attributed in part to new construction methods which produce ditches with nearly vertical sides making them impossible to seed or sod effectively. The use of herbicides, removing vegetation, also contributes to erosion problems.

While the land area mentioned above has the potential to contribute to surface water quality problems, no evidence directly links any specific water quality problems to these areas.

No data is available on erosion areas in Cook County.

c. Septic Systems

Septic systems are widely used as on-site wastewater treatment systems in the Fox basin. At the present time, 42,039 residential septic systems serve an estimated 143,947 people (see Table 19-23). In addition, the basin has 1,115 nonresidential septic systems serving a population equivalent of 10,703. The latter systems serve commercial, recreational, industrial, and institutional establishments. Approximately 3 percent of the septic systems are located in Cook County, 2 percent in Du Page County, 17 percent in Kane County, 38 percent in Lake County, and 40 percent in McHenry County.

Figure 19-7 shows the locations of all septic systems in the basin, and Table 19-24 provides a general description of systems known to be the source of water quality problems or known to have the potential for creating problems.

d. Mining

The Fox River basin contains 41 active and 57 inactive surface mining operations. A large majority of these are gravel pits. The number of active and inactive mining operations by county is as follows:

Du Page	2
Kane	10
Lake	12
McHenry	79
	103

TABLE 19-23 : SUMMARY OF SEPTIC TANK INSTALLATIONS

Fox River BASIN

COUNTY	NUMBER OF SEPTIC SYSTEMS			POPULATION SERVED		
	RESIDENTIAL	NON RESIDENTIAL	TOTAL	RESIDENTIAL	NON RESIDENTIAL (PE)	TOTAL
Cook	1,053	11	1,064	3,967	140	4,107
DuPage	855	9	864	3,230	96 (1)	3,326
Kane	7,185	110	7,295	25,931	1,971	27,902
Lake	16,255	285	16,540	55,159	3,158	58,317
McHenry	16,691	700	17,391	55,660	5,338	60,998
Will	0	0	0	0	0	0
Total	42,039	1,115	43,154	143,947	10,703	154,650

(1) Non-residential population served provided only for septic systems with PE of 35 or greater.

Figure 19-6: LOCATION OF SEPTIC AREAS

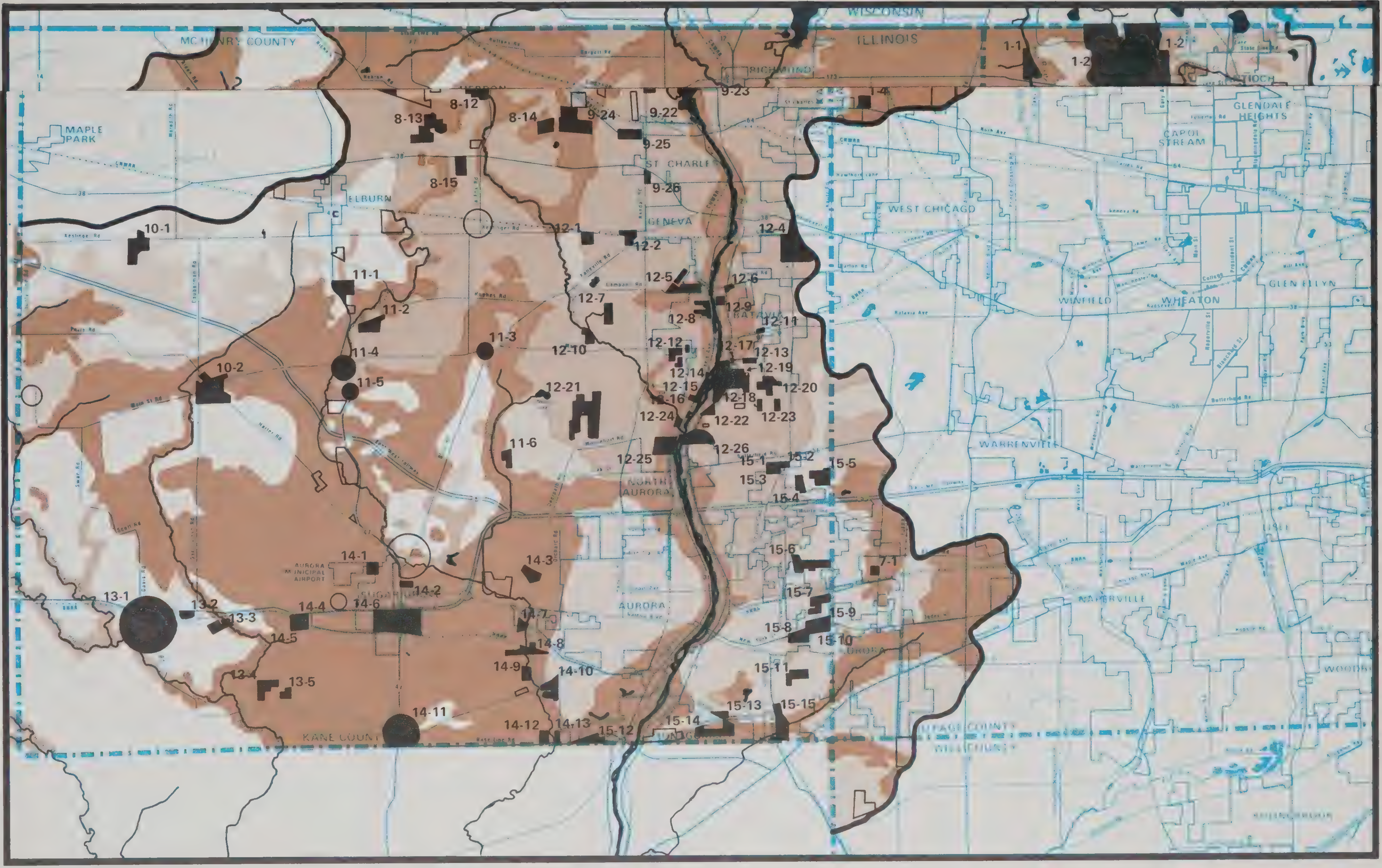


Figure 19-6: LOCATION OF SEPTIC AREAS

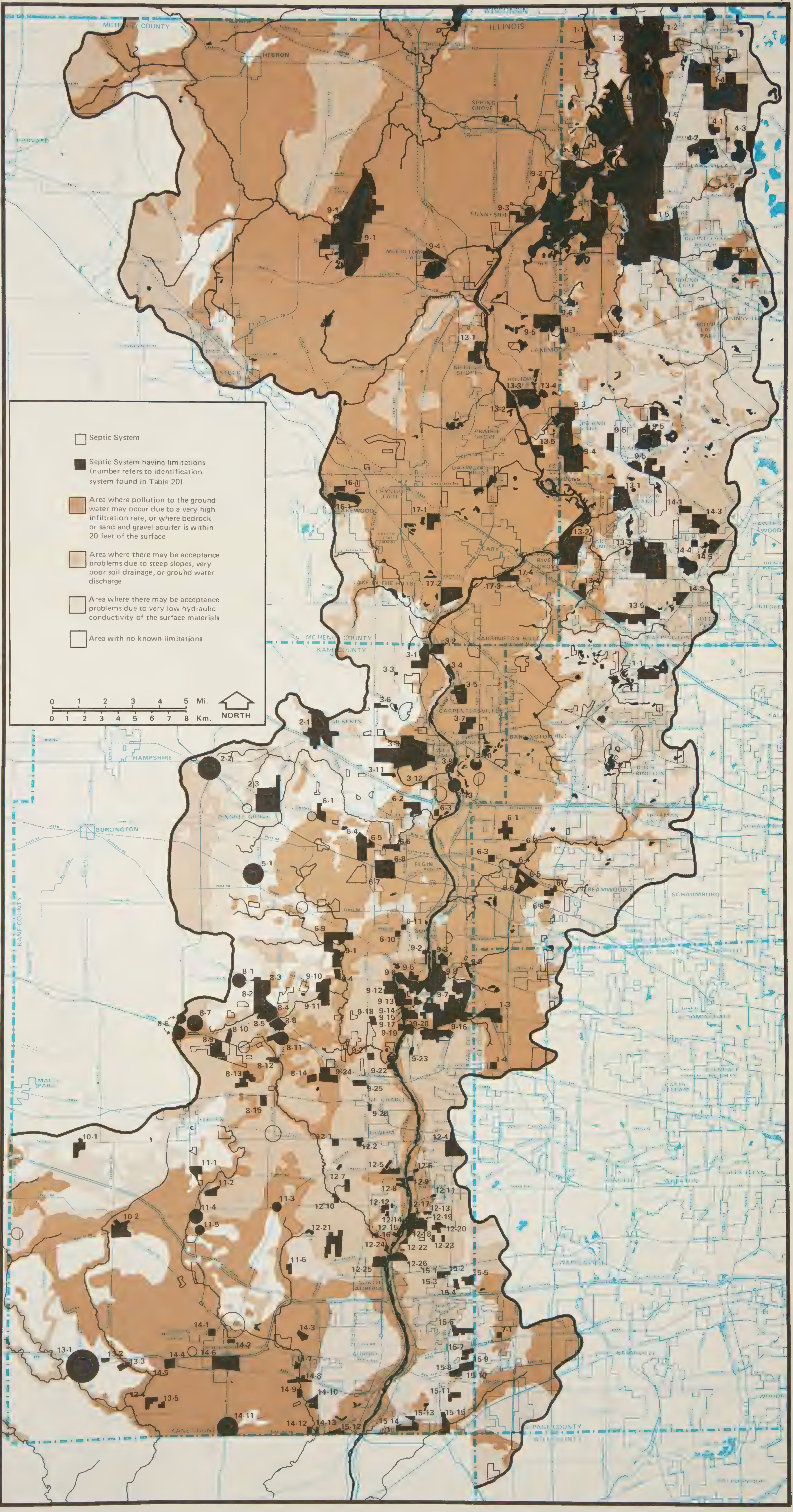


TABLE 19-24 : SEPTIC SYSTEM AREAS HAVING LIMITATIONS

Fox River BASIN

COUNTY	TOWNSHIP	NAME OF AREA (IF AVAILABLE)	NUMBER OF SYSTEMS	POPULATION EQUIVALENT	MAP NUMBER
Cook	Barrington		117	418	1-1
Cook	Hanover		29	118	6-1
Cook	Hanover		15	63	6-2
Cook	Hanover	Elgin	35	146	6-3
Cook	Hanover		22	90	6-4
Cook	Hanover		87	363	6-5
Cook	Hanover		1	5	6-6
Cook	Hanover		20	81	6-7
Cook	Hanover		1	20	6-8
DuPage	Wayne	Wayne	133	504	1-3
DuPage	Wayne		43	163	1-4
DuPage	Naperville		55	262	7-1
Kane	Rutland	Gilberts	96	600	2-1
Kane	Rutland	Starks Corners	7	21	2-2
Kane	Rutland	Pingree Grove	64	225	2-3
Kane	Dundee		48	168	3-1
Kane	Dundee		92	322	3-2
Kane	Dundee		3	10	3-3
Kane	Dundee		16	56	3-4
Kane	Dundee		193	675	3-5
Kane	Dundee		25	88	3-6
Kane	Dundee	East Dundee	62	223	3-7
Kane	Dundee	Sleepy Hollow	515	2500	3-8
Kane	Dundee		42	147	3-9
Kane	Dundee		12	42	3-10
Kane	Dundee		48	168	3-11

TABLE 19-24 : SEPTIC SYSTEM AREAS HAVING LIMITATIONS

Fox River BASIN

COUNTY	TOWNSHIP	NAME OF AREA (IF AVAILABLE)	NUMBER OF SYSTEMS	POPULATION EQUIVALENT	MAP NUMBER
Kane	Dundee		15	53	3-12
Kane	Dundee		12	42	3-13
Kane	Plato	Plato Center	40	120	5-1
Kane	Elgin	Wildwood Valley Sub.	54	189	6-1
Kane	Elgin	Elgin	161	564	6-2
Kane	Elgin	Elgin	17	67	6-3
Kane	Elgin		165	578	6-4
Kane	Elgin		13	45	6-5
Kane	Elgin		15	52	6-6
Kane	Elgin		138	453	6-7
Kane	Elgin	Elgin	69	241	6-8
Kane	Elgin		147	514	6-9
Kane	Elgin		9	31	6-10
Kane	Elgin	South Elgin	1	3	6-11
Kane	Campton		20	70	8-1
Kane	Campton		55	192	8-2
Kane	Campton		2	7	8-3
Kane	Campton		7	25	8-4
Kane	Campton		70	245	8-5
Kane	Campton		46	152	8-6
Kane	Campton		12	42	8-7
Kane	Campton		24	84	8-8
Kane	Campton		17	60	8-9
Kane	Campton		11	39	8-10
Kane	Campton	Wasco	65	3	8-11
Kane	Campton		7	25	8-12

TABLE 19-24 : SEPTIC SYSTEM AREAS HAVING LIMITATIONS

Fox River BASIN

COUNTY	TOWNSHIP	NAME OF AREA (IF AVAILABLE)	NUMBER OF SYSTEMS	POPULATION EQUIVALENT	MAP NUMBER
Kane	Campton		48	168	8-13
Kane	Campton		36	126	8-14
Kane	Campton		5	28	8-15
Kane	St. Charles		53	185	9-1
Kane	St. Charles		25	84	9-2
Kane	St. Charles		58	203	9-3
Kane	St. Charles		30	105	9-4
Kane	St. Charles		76	266	9-5
Kane	St. Charles	Valley View	141	493	9-6
Kane	St. Charles	Valley View	179	626	9-7
Kane	St. Charles		10	35	9-8
Kane	St. Charles		17	60	9-9
Kane	St. Charles		18	63	9-10
Kane	St. Charles		17	60	9-11
Kane	St. Charles		48	168	9-12
Kane	St. Charles		49	171	9-13
Kane	St. Charles		125	437	9-14
Kane	St. Charles		14	49	9-15
Kane	St. Charles	Wayne	147	515	9-16
Kane	St. Charles		54	199	9-17
Kane	St. Charles		26	91	9-18
Kane	St. Charles		50	175	9-19
Kane	St. Charles		92	322	9-20
Kane	St. Charles		21	74	9-21
Kane	St. Charles		18	63	9-22
Kane	St. Charles		9	32	9-23

TABLE 19-24 : SEPTIC SYSTEM AREAS HAVING LIMITATIONS

Fox River BASIN

COUNTY	TOWNSHIP	NAME OF AREA (IF AVAILABLE)	NUMBER OF SYSTEMS	POPULATION EQUIVALENT	MAP NUMBER
Kane	St. Charles		160	560	9-24
Kane	St. Charles		16	21	9-25
Kane	St. Charles		12	42	9-26
Kane	Kaneville		11	35	10-1
Kane	Kaneville		110	350	10-2
Kane	Blackberry		23	81	11-1
Kane	Blackberry		8	28	11-2
Kane	Blackberry		8	28	11-3
Kane	Blackberry		20	70	11-4
Kane	Blackberry		4	14	11-5
Kane	Blackberry		16	56	11-6
Kane	Geneva-Batavia		1	1	12-1
Kane	Geneva-Batavia		7	21	12-2
Kane	Geneva-Batavia		50	175	12-4*
Kane	Geneva-Batavia		78	276	12-5
Kane	Geneva-Batavia		17	60	12-6
Kane	Geneva-Batavia		16	56	12-7
Kane	Geneva-Batavia		38	133	12-8
Kane	Geneva-Batavia		17	46	12-9
Kane	Geneva-Batavia		18	63	12-10
Kane	Geneva-Batavia		4	12	12-11
Kane	Geneva-Batavia		95	334	12-12
Kane	Geneva-Batavia		11	38	12-13
Kane	Geneva-Batavia		40	140	12-14

TABLE 19-24 : SEPTIC SYSTEM AREAS HAVING LIMITATIONS

Fox River BASIN

COUNTY	TOWNSHIP	NAME OF AREA (IF AVAILABLE)	NUMBER OF SYSTEMS	POPULATION EQUIVALENT	MAP NUMBER
Kane	Geneva-Batavia		9	32	12-15
Kane	Geneva-Batavia		1	3	12-16
Kane	Geneva-Batavia		8	225	12-17
Kane	Geneva-Batavia	Batavia	1	3	12-18
Kane	Geneva-Batavia		67	234	12-19
Kane	Geneva-Batavia		20	70	12-20
Kane	Geneva-Batavia		58	203	12-21
Kane	Geneva-Batavia		17	60	12-22
Kane	Geneva-Batavia		19	66	12-23
Kane	Geneva-Batavia		1	3	12-24
Kane	Geneva-Batavia		76	266	12-25
Kane	Geneva-Batavia		84	164	12-26
Kane	Big Rock	Big Rock	165	575	13-1
Kane	Big Rock		2	6	13-2
Kane	Big Rock		30	105	13-3
Kane	Big Rock		44	154	13-4
Kane	Big Rock		12	42	13-5
Kane	Sugar Grove	Sugar Grove	13	46	14-1
Kane	Sugar Grove		3	9	14-2
Kane	Sugar Grove		21	73	14-3
Kane	Sugar Grove		12	42	14-4
Kane	Sugar Grove	Sugar Grove	1	3	14-5
Kane	Sugar Grove	Sugar Grove	379	1330	14-6
Kane	Sugar Grove		29	101	14-7
Kane	Sugar Grove		25	88	14-8
Kane	Sugar Grove		17	60	14-9

TABLE 19-24 : SEPTIC SYSTEM AREAS HAVING LIMITATIONS

Fox River BASIN

COUNTY	TOWNSHIP	NAME OF AREA (IF AVAILABLE)	NUMBER OF SYSTEMS	POPULATION EQUIVALENT	MAP NUMBER
Kane	Sugar Grove		15	53	14-10
Kane	Sugar Grove		33	120	14-11
Kane	Sugar Grove		36	126	14-12
Kane	Sugar Grove		6	21	14-13
Kane	Aurora		13	45	15-1
Kane	Aurora		1	3	15-2
Kane	Aurora		2	4	15-3
Kane	Aurora		42	147	15-4
Kane	Aurora		24	84	15-5
Kane	Aurora		69	241	15-6
Kane	Aurora		23	80	15-7
Kane	Aurora		37	129	15-8
Kane	Aurora		4	12	15-9
Kane	Aurora		6	18	15-10
Kane	Aurora		24	84	15-11
Kane	Aurora		35	122	15-12
Kane	Aurora		7	18	15-13
Kane	Aurora		66	231	15-14
Kane	Aurora		8	24	15-15
Lake	Antioch	Fox River Spring	79	250	1-1
Lake	Antioch	Channel Lake - Lake Catherine	1622	5361	1-2
Lake	Antioch	Antioch Lake	227	1012	1-3
Lake	Antioch	Loon Lake	498	2081	1-4
Lake	Antioch	Lakes Region	2105	7208	1-5
Lake	Lake Villa	Larson Industrial Park	8	17	4-1
Lake	Lake Villa	Cedar Lake	221	808	4-2

TABLE 19-24 : SEPTIC SYSTEM AREAS HAVING LIMITATIONS

Fox River BASIN

COUNTY	TOWNSHIP	NAME OF AREA (IF AVAILABLE)	NUMBER OF SYSTEMS	POPULATION EQUIVALENT	MAP NUMBER
Lake	Lake Villa	Deep Lake	295	982	4-3*
Lake	Lake Villa	Venetian Village	715	2608	4-5*
Lake	Grant	Fox Lake	818	2621	5-1
Lake	Avon	Round Lake-Highland Lake	239	832	6-1
Lake	Wauconda	Lilymoor	32	112	9-1
Lake	Wauconda	Volo	78	382	9-2
Lake	Wauconda	Island Lake-Mylith Park	697	2682	9-3
Lake	Wauconda	Williams Park	186	674	9-4
Lake	Wauconda	Unincorporated Wauconda	435	1564	9-5
Lake	Cuba	Tower Lake	293	1022	13-1
Lake	Cuba	Fox River	445	1561	13-2
Lake	Cuba	North Barrington	446	1583	13-3
Lake	Cuba	Lake Barrington Industrial Park	38	97	13-4
Lake	Cuba	Unincorporated Barrington	261	911	13-5
Lake	Ela	Valentine Manor	42	152	14-1
Lake	Ela	Hawthorne Woods-Area 2	77	277	14-3
Lake	Ela	Woodland Subdivision	30	108	14-4
Lake	Ela	Echo Lake	178	646	14-5
Lake	Ela	Deer Park - Area 2	20	78	14-12*
Lake	Ela	Deer Park - Area 3	32	115	14-13
McHenry	McHenry	Wonder Lake	2248	7524	9-1
McHenry	McHenry	Pistakee Highlands	89	303	9-2
McHenry	McHenry	Sunnyside Estates	605	2032	9-3
McHenry	McHenry	McCullom Lake	377	1242	9-4
McHenry	McHenry	Lilymoor	138	454	9-5
McHenry	McHenry	Lakemoor	153	502	9-6

TABLE 19-24 : SEPTIC SYSTEM AREAS HAVING LIMITATIONS

Fox River BASIN

COUNTY	TOWNSHIP	NAME OF AREA (IF AVAILABLE)	NUMBER OF SYSTEMS	POPULATION EQUIVALENT	MAP NUMBER
McHenry	Nunda	McHenry Shores	342	1163	13-1
McHenry	Nunda	Riverside Park	124	421	13-2
McHenry	Nunda	Holiday Hills	248	841	13-3
McHenry	Nunda	Griswald Lake	102	341	13-4
McHenry	Nunda	Portens Jacoby's	147	499	13-5
McHenry	Grafton	Crystal Lake	117	398	16-1*
McHenry	Algonquin	Crystal Lake Manor	299	1067	17-1
McHenry	Algonquin	Algonquin Infiltration Gallery	384	1317	17-2
McHenry	Algonquin	Venetian Gardens	177	623	17-3
McHenry	Algonquin	Hillview Estates	132	463	17-4

While the potential for water pollution from these areas is recognized, aside from the two situations described below, no evidence links these areas to specific groundwater or surface water quality problems. The two exceptions to this statement are (1) 14 gravel pits in McHenry County where groundwater pollution could exist, depending on site geology and the extent of possible dumping; and (2) one active surface mining operation where there is evidence of sediment flowing from the mining area into Blackberry Creek.

No information is available on the Cook County portion of the basin.

e. Waste Disposal Sites

The Fox River basin contains 45 active or inactive surface waste disposal sites: 3 sanitary landfills, 11 landfills, 24 dumps, and 7 junkyards. The distribution of surface waste disposal sites by county is as follows:

Kane	10
Lake	3
McHenry	32
	45

McHenry County identified four dumps operating illegally in the basin and two junkyards in the city of Woodstock which present a surface runoff hazard. Kane County identified two landfill operations known to cause surface and/or subsurface water pollution: Tri-County Landfill in St. Charles Township and an unnamed landfill located in Aurora Township.

The remaining waste disposal sites are recognized as possible sources of water pollution, but no evidence directly links them to any specific quality problems.

No information is available on the Cook County part of the basin.

f. Hydrologic Modification

Many rivers in northeastern Illinois contain channels, dams, weirs, and other structures which significantly influence and control the dissolved oxygen concentrations in these water bodies. Consideration was given to these structures in the water quality model. The influence of a channel dam on water quality can often be dramatic. Weirs and dams create pools which have DO levels below or above those normally expected if the stream is free flowing. Forty-eight dams were analyzed in the region of which 14 are in the Fox River basin. In general, the water quality impacts of dams in the Fox River basin were found to be negative. Figure 19-8 shows the locations of these dams.

In addition to the influence of dams on water quality, streams in the Fox River basin are periodically ditched, straightened, or channelized. The Illinois Department of Conservation has identified the following 19 streams which have undergone some modification:

Big Rock Creek
Blackberry Creek
Bowes Creek
Brewster Creek
Ferson Creek
Fitchie Creek
Indian Creek
Long Run Ditch
Tyler Creek
Welch Creek
Mill Creek
Norton Creek
Otter Creek
Sequoit Creek
Spring Creek
Squaw Creek
Stoney Creek
Trevor Creek
Waubansee Creek

A dredging project was recently completed in Nippersink Lake under the auspices of the Chain of Lakes-Fox River Commission. Forty-thousand cubic yards of dredged spoil was disposed on a 4-acre site located approximately a mile and a half north of the village of Fox Lake near Grass Lake Road.

g. Agricultural Runoff

There are several agricultural sources of surface and groundwater pollution. Pollutants include sediment, plant nutrients, pesticides, and animal wastes, all of which interact in undefined ways as they move from their agricultural sites to surface and groundwaters. Because of the uncertainty in predicting the changes in the form and location of these pollutants, the amounts of materials at or near agricultural areas are difficult to estimate. There are approximately 959 square miles in the Fox River basin; 744 square miles (78 percent) are categorized as vacant, agricultural, and forest acres. During storm events, agricultural pollutants enter the Fox River by direct overland flow and through various tributary streams. Agricultural pollutants may also enter streams through groundwater during low-flow periods.

During 1976, this Commission also completed an agricultural survey of fertilizer (nutrients) and pesticide usage, as well as an inventory of livestock. Details of this survey for each county in the NIPC six-county planning area are contained in Staff Paper No. 25.

h. Marine Activities

Marine activities may affect water quality in the basin through oil or gasoline spills, sanitary sewage disposal, dumping of litter, and disturbance of sediment or benthic deposits. Since the Fox River is used for recreational boating, control of potential pollutants must rely on individual boat owner's complying with the law.

In 1965, the McHenry Lock experienced 17,900 boat lockages; this was one of the larger figures in the United States. On an average day, some 92 boats used the lock. A peak weekend involved 325 boats. The boating season extends from mid-May through early October with seasonal variations as follows: May - 74 boats/day; June - 115 boats/day; July - 144 boats/day; August - 139 boats/day; September - 80 boats/day; October - 39 boats/day; and November - 2 boats/day. Boat concentrations extend from Wilmot

Dam in Wisconsin through the Chain of Lakes (with its nine major interconnecting lakes) to Algonquin.

There are many ancillary facilities along the shoreline which have the potential to cause pollution of the river. The general impact on water quality of these facilities, as compared to actual boating activities, is unknown. Two sanitary wastewater pump-out facilities, Watts Marine (Pistakee Lake) and Maules Marine (Fox Lake), enhance the protection of water quality. Conversely, improved water quality should produce increased use of marine activities.

19.06 RESIDUALS - EXISTING CONDITIONS

a. Residual Sources

1. Point Sources

As previous mentioned, there are 38 municipal type wastewater treatment plants, 6 industrial plants, 41 miscellaneous plants, and 56 other wastewater dischargers in the Fox River basin. Each of these facilities produces residuals which must be safely disposed of.

2. Nonpoint Sources

Septic System Residuals

It is difficult to accurately estimate the present annual volume of septic sludge produced in this basin. However, using an average annual volume of 70 gallons of septage per person, it is possible to make a rough approximation. There are 143,947 persons in the basin served by residential septic systems. Thus, 143,947 x 70 gallons = 10,076,290, or about 10.1 million gallons of residential septage each year. This figure would be higher if nonresidential septage were included.

Agricultural Type Residuals

This type of residual is associated with concentrated feedlot operations. There are currently three feeding operations in the basin, but, there is no available information on the amount of residual wastes generated from those facilities.

b. Residual Disposal Practices

In the Fox basin the most common means of sludge disposal is land disposal, either by landfilling or by land application.

Landfill

There are four landfill sites in the basin.

1. Gravel Pit

   In McHenry County, northwest of Cary, there is an old gravel pit that is currently serving as a sanitary landfill. This site accepts approximately 225 tons of sludge annually from the Fox River Grove sewage treatment plant. In addition, the site accepts an undetermined amount of sludge from unidentified sources, including septic tank pumpage.

2. Veugler's Dump

   This landfill site is located on Sands Road in McHenry County, west of the above mentioned gravel pit site. This site accepts unknown volumes of municipal type sludge from the Woodstock north and south plants and from Crystal Lake's plants.

3. Midway Landfill

   This site is located in southeast of Geneva in Kane County. The facility is used for the disposal of approximately 8,600 cubic yards each year of municipal type sludge generated by the Batavia and St. Charles wastewater treatment plants plus an undetermined amount of septage. The site is owned by Kane County and is leased to Midway Landfill, Inc. The operational life of the site is estimated at 10 more years.

4. Schneider Gravel Pit

   The City of Elgin's water department treatment plant is currently the only known user of this gravel pit, which is owned and operated by Ed Schneider. This gravel pit has a clay bottom and is located on Highland Avenue west of Elgin. It is an IEPA approved site, which accepts an estimated 10,600 cubic yards of sludge a year from Elgin's water plant.

Sixteen land application sites currently are in operation, many of them privately owned farmlands. Two sites are located in Lake County. 14 sites in McHenry County, and several unidentified sites in Kane County. The inventory of sludge disposal facilities prepared by the Kane County Development Department for the Northeastern Illinois Planning Commission in late 1976 did not identify any land application sites by specific name and location. However, the inventory did recognize the practice of spreading the sludge on unidentified, non-permitted agricultural land and of disposing of sludge by individual pick-up for use as a soil conditioner on gardens and lawns.

The two sites in Lake County include the Barrington Hills Country Club, which applies dried sludge as a fertilizer to its golf course, and 25 acres of farmland owned by a private company, Grayslake Gelatin. At the Grayslake site, deep trenches are excavated to be used for final disposal of industrial type sludge through a simple process of burying the sludge with a layer of soil.

The 14 sites in McHenry County are individual private farms.

Several facilities located in the Fox basin dispose of their sludge at sites located outside the basin. These sites include, the Lake County Public Works Department's New Century Town, Lester's Materials, and Purves Sludge Farm in Lake County and Sexton's Landfill in Du Page County. Sludge from several miscellaneous plants is hauled to the LCDPW New Century Town plant. Here, it is further treated and dried, and taken to Lester's Materials where it is mixed with sand and peat and sold to the public as a soil conditioner and fertilizer.

Sexton's Landfill accepts 1,650 tons of industrial type sludge annually from the Woodstock Die Casting Company plant. Little else is known about this disposal site.

19.07 EXISTING MANAGEMENT PROGRAMS

The major features of the existing water quality management system in northeastern Illinois have already been discussed in Part I of this report. In this chapter, management programs in the Fox River basin are presented, but only to the extent that it is necessary to clarify the previous discussion.

Table 19-22 is a list of the public agencies and private utilities in the basin which are currently involved in water quality related activities. Variations in programs and responsibilities between these agencies are indicated by a numerical code.

TABLE 19-25

EXISTING LOCAL WATER QUALITY MANAGEMENT AGENCIES AND PROGRAMS: FOX RIVER BASIN*

MUNICIPALITIES

Algonquin	1,2,3,4 +
Antioch	1,2,4
Aurora	1,4
Barrington	1,2,3
Barrington Hills	
Bartlett (DuPage)	1,2,4
Batavia (DuPage)	1,2,4
Carpentersville	1,2
Cary	1,2
Crystal Lake	1,2
Deer Park (Upper Des Plaines)	3,4
East Dundee	1,2
Elburn (Kishwaukee)	1,2,4
Elgin	1,3,4
Fox Lake	1,2
Fox River Grove	1,2
Fox River Valley Gardens	
Geneva	1,2,4
Gilberts	
Grayslake (Upper Des Plaines)	1,2,4
Hainesville	1
Hanover Park (DuPage)	1,2,3,4
Hawthorn Woods (Upper Des Plaines)	
Hebron	1,2
Hoffman Estates (Salt Creek)	1,3,4
Holiday Hills	
Inverness (Salt Creek)	3,4
Island Lake	4
Lake Barrington	
Lake In The Hills	
Lakemoor	
Lake Villa	1,2
Lakewood (Kishwaukee)	1 +
Lake Zurich (Upper Des Plaines)	1,2,3,4
McCullom Lake	
McHenry	1,2
McHenry Shores	4
Montgomery	1,3,4
Naperville (DuPage)	1,2,4
North Aurora	1
North Barrington	3
Oakwood Hills	
Pingree Grove	
Prairie Grove	
Richmond	1,2
Round Lake	1
Round Lake Beach (Upper Des Plaines)	1
Round Lake Heights	1
Round Lake Park	1
Schaumburg (DuPage, Salt Creek)	1,3,4
Sleepy Hollow	
South Barrington	
South Elgin	1,4
Spring Grove	4
St. Charles (DuPage)	1,2,3,4
Streamwood (DuPage)	1,2,4
Sugar Grove	1,3,4
Sunnyside	
Sunrise Ridge	
Tower Lakes	3
Valley View	
Wauconda	1,2
Wayne	
West Dundee	1,2
Woodstock (Kishwaukee)	1,2,4

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* Additional basins shown in parentheses for those municipalities which cross basin boundaries.

+ Numbers indicate existing water quality related activities as follows:

1. Wastewater collection agency
2. Wastewater treatment agency
3. Has enacted erosion and sediment control regulations
4. Has enacted stormwater detention regulations or equivalent sanitary district regulations apply

TABLE 19-25

EXISTING LOCAL WATER QUALITY MANAGEMENT AGENCIES AND PROGRAMS: FOX RIVER BASIN (Continued)

SANITARY DISTRICTS

Aurora	2	+	Lake In The Hills	1,2	+
Elgin	2		Lakes Region		
Fox Lake Hills			Round Lake	2	
Island Lake			Wasco		

COUNTIES

Cook	4	Lake	1,2,3,4
DuPage	1,2	McHenry	3,4
Kane	3,4	Will	3,4

SOIL AND WATER CONSERVATION DISTRICTS

Kane--DuPage Counties
Lake County
McHenry County
North Cook
Will-South Cook Counties

+ Numbers indicate existing water quality related activities as follows:

1. Wastewater collection agency
2. Wastewater treatment agency
3. Has enacted erosion and sediment control regulations
4. Has enacted stormwater detention regulations or equivalent sanitary district regulations apply

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(It should be noted that this list is based on information gathered from a variety of sources over a period of many months. An attempt has been made to compile the most complete and current information available. However, due to the number and variety of local programs in the region, as well as the constantly evolving nature of these programs, this list may well be incomplete. The 208 staff expects it will be necessary to periodically revise or correct the list; they would appreciate any assistance that local agencies or individuals can provide.)

19.08 THE BASIN PLANNING PROCESS

Computer simulation has indicated that water quality in the Fox River basin is generally good compared to other basins in the region. Only four output points (121, 310, 370, 480) failed to meet NIPC's water quality criteria of 5 mg/l DO concentration for at least 95 percent of the time. However, violations of the state standard of 5 mg/l DO for 100 percent of the time were simulated at 9 of the 13 output points.

Violations of the in-stream ammonia water quality standard of 1.5 mg/l were simulated at 7 of the 13 output points, and phosphorous concentrations in excess of .20 mg/l were modeled at all output points.

The sources of these pollutants are the following:

- Overflows from combined sewers (which account for 2 percent of the BOD and 2 percent of the ammonia in the basin);
- Discharges from wastewater treatment plants (8 percent of the BOD and 59 percent of the ammonia);
- Stormwater runoff (18 percent of the BOD and 28 percent of the ammonia);
- Pollution from Wisconsin (72 percent of the BOD and 12 percent of the ammonia).

These four sources of pollution were the focus of efforts to develop a first test plan for the basin.

a. The First Test Plan: Assumptions and Contents

During the development of a Fox River basin plan, NIPC staff and consultants identified existing water quality conditions and major sources of water pollution. Staff members and basin residents suggested water pollution control strategies to be included in a first test plan for the year 2000. These suggestions were reviewed by 208 Local Steering Committees in the basin.

In addition to Local Steering Committee recommendations, the first test plan was shaped by assumptions made to reflect forecasted population increases, land cover changes, improvements in wastewater and stormwater treatment, flood control and channeling, and changes in agricultural practices.

Population

NIPC population forecasts for the year 2000 were used to determine the land cover changes and wastewater loads. These forecasts were made for each of the 13 reaches of the basin. A 68.9 percent increase in population was forecast for the basin.

Land Cover

Land cover and land use in the basin were determined by satellite photography and field surveys. This information was divided into four categories of land use: lowlands-marshes which include swamps and forests lying close to rivers and streams; grasslands open to the filtration of rainwater and snowmelt but not tilled regularly, including pastures, parks, golf courses, and upland forest; croplands regularly tilled for agricultural purposes (there is some exchange between croplands and grasslands due to crop rotation); and impervious surfaces covered with buildings, roads, and parking lots. For the first test plan, estimates of land cover changes were made using population and employment forecasts. Land required for new urbanization in the basin was taken from the grassland and cropland categories first. When this land was largely depleted, land from the lowland category was taken for urban purposes. Land cover estimates are shown in Table 19-26.

Wastewater Facilities Plans

Extensive planning has been conducted in recent years for the improvement of existing wastewater treatment facilities, both public and private, and the creation of new facilities to serve newly developing areas. These plans were included in the forecast of water quality conditions for the year 2000. In summary, it was assumed that all planned improvements in municipal wastewater treatment plants (201 facilities plans) will be in operation and that industrial treatment plants will meet required water quality standards in their effluent discharges.

Industrial Treatment Plants

Future industrial biodegradable and nutrient loads were assumed to be treated by industrial treatment plants the same as loads treated by municipal treatment plants north of Johnsburg.

Phosphate Reduction

The City of Chicago and several suburbs have enacted ordinances limiting the phosphate content of detergents. Because such a substantial portion of the metropolitan area market has enacted limitations on phosphate in detergents, most distributors have withdrawn phosphate detergents from the entire area. Over three-fourths of the detergent sold for domestic purposes in the Chicago metropolitan area is now phosphate free, and existing water quality conditions already show the effect of this marketing practice. In considering changes in wastewater treatment practices for the year 2000, it was assumed that regulations limiting the amount of phosphate in domestic detergents would expand to cover commercial and industrial uses as well. Based upon studies of the effect of detergent phosphate reductions on wastewater treatment plant operations, it was assumed that phosphate concentrations in plant effluent for the year 2000 will be two-thirds that of existing levels.

TABLE 19-26: CHANGES IN LAND COVER, 1976-2000

Category	1976 Land Cover Estimates	Year 2000 Land Cover Forecast	% Change
Lowlands	175.4 sq.mi.	175.4 sq.mi.	0
Grasslands	421.8 sq.mi.	436.0 sq.mi.	+3.4
Croplands	265.5 sq.mi.	233.0 sq.mi.	-12.2
Impervious	55.4 sq.mi.	73.7 sq.mi.	+32.9
TOTAL	918.1 sq.mi.	918.1 sq.mi.	

No additional phosphorous removal at treatment plants was represented in the first test plan, except that "total p" would not exceed 1.0 mg/l in the effluents from the following sewage treatment plants:

1. Hebron
2. Richmond
3. Woodstock North
4. Valley High Nursing Home
5. Fox Lake

Combined Sewer Overflows

It was assumed that combined sewer overflows in the Fox River basin would be eliminated by the year 2000.

Boundary Conditions

Water entering Illinois at the Wisconsin line in the year 2000 was assumed to meet water quality standards established by the IPCB Rules and Regulations, Chapter 3, "Water Quality Standards." (The Southeastern Wisconsin Regional Planning Commission and the Wisconsin Department of Natural Resources were requested to evaluate this assumption and indicate their ability to meet these standards.)

Dissolved Oxygen	5.0 mg/l, 16 hours in a 24-hour period
Ammonia	1.5 mg/l
BOD	5.78 mg/l
PO_4	0.08 mg/l
NO_3	1.49 mg/l

Urban Stormwater Runoff

In existing urban areas, for the year 2000, in simulating future water quality, it was assumed that 25 percent of the materials constituting biochemical oxygen demand in urban stormwater runoff will be removed from the land surface (largely through street sweeping, stormwater detention, tree planting programs, catch basin cleaning, vegetation filters, and soil erosion control) and prevented from entering the water of the Fox River. In newly developed urban areas pollutant loads from runoff will be reduced to levels consistent either with loads generated by the Lake County small watershed study, or 50 percent, whichever is greater.

Air Deposition of Pollutants

In the first test plan for the year 2000, it was not possible to make an adjustment for a change in the amount of pollutants that fall out or are washed out of the air, since there is no specific factor in the water quality model to represent the impact of air deposition of pollutants. Pollution washoff from rural grasslands is assumed to derive from three sources: decaying vegetable matter; animal grazing and feeding; and air deposition. At this stage in planning technology, we do not know enough about the nutrient cycle to enable us to isolate the water quality impacts of each of these three sources.

Septic Systems

In the first test plan, it was assumed that the effects of septic systems on water quality would be eliminated by the year 2000, either by the conversion to sewage collection and treatment systems or (in the case of septic systems outside municipal service areas) by improvements and control of septic systems in operation.

Soil Conservation

The U.S. Soil Conservation Service aided NIPC staff in estimating how much land could be brought under conservation practices and which practices could be used. In the Fox River basin, 82.8 square miles of land were forecast to be in conservation practices by year 2000 that were not under conservation practice in 1976. Additionally, 13.9 square miles of cropland were assumed to have been converted to grasslands by the year 2000.

Although a comprehensive farm plan would include a wide range of BMPs, the following four practices and several combinations have been recommended for implementation: conservation tillage, contouring, terracing, and cropland conversion to pastureland. These practices were selected because of their direct affects on water quality.

Animal Populations

The change in animal populations associated with food production was calculated for each township in the region. However, these changes could not be reflected in the first test plan because not enough is known about the impact of animal pasturing and feedlot operations to reflect their influence separately in the water quality model.

Stream Flow Changes

No changes from existing conditions are assumed to have occurred in the channel system, nor are new reservoirs assumed to have been constructed by the year 2000.

Shading of Streams

In the simulation of year 2000 water quality conditions, no changes were made in the factors used to represent the shading of waterways by trees and bushes.

b. Simulated Results of the First Test Plan

If a water quality program containing all of the features of the first test plan were implemented, water quality in the Fox River basin would hold its own against the introduction of additional pollution from further urbanization. In other words, water quality in the year 2000 would be essentially the same as it is today - relatively clean in most reaches but with pollution problems in others.

First test plan efforts to clean up the water included improved wastewater treatment, improved treatment of combined sewer flows, street sweeping and vacuuming, cropland conservation practices, and the elimination of problem septic systems.

The single greatest improvement in water quality assumed in the first test plan was an improvement in conditions at the Wisconsin boundary. It was assumed that water flowing into Illinois from the Wisconsin part of the Fox basin would meet Illinois water quality standards.

This improvement and other improvements would generally be balanced off, however, by the introduction of new pollution. Most of this new pollution would be from increased loads on wastewater treatment facilities. These facilities, located primarily in the middle and lower parts of the basin, would discharge a greater volume of effluent at a poorer quality because of the increased loads resulting from new urbanization.

Tables 19-27 and 19-28 illustrate the changes in pollutant concentrations and violations of water quality standards as a result of the first test plan for selected reaches in the basin. As mentioned previously, BOD concentrations tend to remain at or near present levels. Mean ammonia levels also tend to remain the same, but there is a general decrease in the frequency and duration of violations. Mean nitrate levels remain constant. The mean phosphate concentration in reaches in the basin remains near present levels. Concentrations of phosphate in excess of .05 mg/l are more frequent in the basin; however, the duration of these events is shorter than those under existing conditions. With respect to DO concentrations, the general level of water quality remains good. Some deterioration was noted in Reach 113 where conditions went from excellent to good. Water quality in reaches 121 and 310 improved from fair to good. Reaches 370 and 480 continued to show the worst water quality in the basin with both remaining at fair quality.

A more specific understanding of the types of effects the first test plan would have on the Fox River basin can be gained through a comparison of year 2000 data for Reach 480 with data on existing conditions in this same reach. Reach 480 provides a summary of conditions in the basin, since the water from all other reaches drains into it. The results of the year 2000 simulation for Reach 480, shown in Table 19-29, show that the role of treatment plants as pollution sources increases dramatically as a result of the improvement of boundary conditions and control of other pollution sources. The total tons per year of BOD entering Reach 480 decreases by over 29 percent. The total tons per year of ammonia increases by 64 percent. Nitrate and phosphate increase by 42 percent and 45 percent, respectively. These increases are due almost soley to increased wastewater flows from treatment plants.

Percent of Time Standards Are Violated

In the formulation of strategies in the initial areawide plan, an attempt was made to develop plans that would allow all streams to comply with state standards 95 percent of the time. Table 19-30 illustrates the effect that the first test plan would have on compliance with standards for all reaches of the Fox River basin. In general, the percent of time that the DO standard is violated remained about the same, except in Reaches 310 and 370, where there is a noticeable improvement in water quality, and in Reach 480, where there is a decline in water quality. The percentage of time other standards are violated tends to remain steady, except in Reach 117 where ammonia problems decrease and in Reach 270 where ammonia problems increase.

c. The Second Test Plan: Assumptions, Contents and Results

The second test plan was developed through much the same process described earlier for the first test plan. Simulation results for the first test plan were publicized and discussed at a series of public meetings in the basin. A second test plan evolved out of these discussions.

Unlike the first test plan where all suggestions were lumped together into one simulation, many of the second test plan suggestions were tested separately.

TABLE 19-27: COMPARISON OF POLLUTANT CONCENTRATIONS, EXISTING CONDITIONS – FIRST TEST PLAN – SECOND TEST PLAN

Water Quality Indicators	Standard(1) (or other level)	REACH		REACH		REACH	
		31		106		113	
		Existing	1st	Existing	1st	Existing	1st
BOD (mg/l) Maximum	None	30.8	22.9	32.0	20.4	24.3	23.4
Minimum		1.1	.94	1.9	2.17	11.2	8.03
Mean		6.3	5.43	6.8	6.08	17.6	15.0
Ammonia (mg/l) Maximum		4.9	4.51	.9	1.07	.3	.31
Minimum		.1	.05	.1	.09	0	0
Mean		.5	.30	.2	.21	.2	.16
Frequency of Violation	1.5(1)	42	26	0	0	0	0
Average Duration of Violations (hours)	1.5(1)	4	3	0	0	0	0
Nitrate (mg/l) Maximum	None	5.8	7.13	4.3	4.59	5.0	4.74
Minimum		.5	.49	.3	.78	0	0
Mean		3.1	3.84	2.4	2.86	1.2	1.16
Frequency of Violation	10.0	0	0	0	0	0	0
Average Duration of Violations (hours)	10.0	0	0	0	0	0	0
Phosphate (mg/l) Maximum		1.2	1.90	.6	.40	.6	.55
Minimum		.1	.05	0	0	0	0
Mean		.3	.27	.2	.19	.2	.16
Frequency of Violation	.05	1	3	102	116	102	243
	.20	99	115	71	33	15.0	5
Average Duration of Violations (hours)	.05	26300	8770	249	217	221	60
	.20	214	184	208	359	627	1110

(1) Illinois Pollution Control Board Standard

TABLE 19-27: COMPARISON OF POLLUTANT CONCENTRATIONS, EXISTING CONDITIONS – FIRST TEST PLAN

Water Quality Indicators	Standard(1) (or other level)	REACH 117		REACH 121		REACH 270	
		Existing	1st	Existing	1st	Existing	1st
BOD (mg/l) Maximum	None	79.4	27.4	22.4	20.5	101	58.9
Minimum		2.0	1.62	8.5	6.86	3.1	2.37
Mean		11.2	7.53	12.8	12.2	125	9.01
Ammonia (mg/l) Maximum		9.3	3.79	.2	.22	5.1	4.88
Minimum		0	0	0	0	.2	.33
Mean		1.8	1.8	.1	.13	1.2	1.68
Frequency of Violation	(1) 1.5	121	11	0	0	43.0	93
Average Duration of Violations (hours)	(1) 1.5	95.0	4	0	0	100	116
Nitrate (mg/l) Maximum	None	5.6	3.87	6.5	6.69	5.9	5.94
Minimum		0	.20	0	0	0.0	89
Mean		2.5	2.07	1.8	1.93	4.7	4.46
Frequency of Violation	10.0	0	0	0	0	0.0	0
Average Duration of Violations (hours)	10.0	0	0	0	0	0.0	0
Phosphate (mg/l) Maximum		1.7	.35	.8	.78	2.7	2.73
Minimum		0	0	0	0	.1	.13
Mean		0.4	.10	.2	.19	.6	.4
Frequency of Violation	.05	39	139	133	13	1.0	1
	.20	111	9	5.0	8	9.0	37
Average Duration of Violations (hours)	.05	672	66	141	1070	26300	26300
	.20	210	54	2300	1810	2920	688

(1) Illinois Pollution Control Board Standard

TABLE 19-27: COMPARISON OF POLLUTANT CONCENTRATIONS, EXISTING CONDITIONS – FIRST TEST PLAN

Water Quality Indicators	Standard(1) (or other level)	REACH		REACH		REACH	
		300		310		340	
		Existing	1st	Existing	1st	Existing	1st
BOD (mg/l) Maximum	None	52.4	38.9	25.2	22.9	117	96.2
Minimum		.9	.52	6.7	6.21	1.4	.78
Mean		8.4	8.38	12.8	13.1	16.4	13.2
Ammonia (mg/l) Maximum		3.6	3.71	5.6	5.64	2.7	2.67
Minimum		0.0	.03	0	.04	.1	.03
Mean		.3	.34	.2	.21	.5	.43
Frequency of Violation	1.5(1)	28.0	25	1.0	1	30.0	23
Average Duration of Violations (hours)	1.5(1)	4.0	4.3	26.0	26	59.0	70.7
Nitrate (mg/l) Maximum	None	6.0	6.0	6.4	6.44	.1	9.00
Minimum		.1	.09	0.0	.02	.1	.06
Mean		5.7	5.71	1.9	2.03	7.9	7.72
Frequency of Violation	10.0	0	0	0	0	0	0
Average Duration of Violations (hours)	10.0	0	0	0	0	0	0
Phosphate (mg/l) Maximum		2.6	2.64	4.9	4.92	1.9	1.85
Minimum		0	.01	0	.02	0	.02
Mean		.2	.22	.3	.24	.4	.24
Frequency of Violation	.05	15.0	21	20.0	187	16.0	16
	.20	146	172	13.0	10	86.0	143
Average Duration of Violations (hours)	.05	1750	1250	1250	111	1640	1640
	.20	158	65.1	1180	1180	296	83.2

(1) Illinois Pollution Control Board Standard

TABLE 19-27 : COMPARISON OF POLLUTANT CONCENTRATIONS, EXISTING CONDITIONS – FIRST TEST PLAN

Water Quality Indicators	Standard(1) (or other level)	REACH		REACH		REACH		REACH	
		360		370		430		480	
		Existing	1st	Existing	1st	Existing	1st	Existing	1st
BOD (mg/l) Maximum	None	96.1	65.9	29.5	29.3	114	96.6	43.7	43.4
Minimum		2.4	1.86	6.1	5.97	2.4	2.03	6.9	6.45
Mean		15.2	10.4	12.9	13.8	16.0	14.4	15.1	15.9
Ammonia (mg/l) Maximum		2.8	2.74	5.8	5.77	3.5	3.07	5.8	5.78
Minimum		0.0	.06	.1	.13	0	0	0	0
Mean		.5	.29	.4	.43	.6	.62	.3	.34
Frequency of Violation	1.5(1)	7.0	5	10.0	3	28	23	1	1
Average Duration of Violations (hours)	1.5(1)	33.0	8.2	34.0	50.0	62	70	34	35
Nitrate (mg/l) Maximum		12.7	7.28	6.2	6.05	15.4	15.5	7.8	7.89
Minimum		0.0	.27	0	.01	.5	.36	0	.01
Mean		5.7	5.49	2.0	2.05	13.3	12.9	2.4	2.42
Frequency of Violation	10.0	4.0	0	0	0	109	120	0	0
Average Duration of Violations (hours)	10.0	204	0	0	0	209	185	0	0
Phosphate (mg/l) Maximum		4.9	2.77	5.0	4.99	4.0	3.99	5	4.99
Minimum		0.0	.02	0	.03	0	0	0	.01
Mean		.7	.21	.4	.34	.5	.46	.4	.40
Frequency of Violation	.05	22.0	58	1.0	75	59	46	166	163
	.20	53.0	120	39.0	46	89	90	17	53
Average Duration of Violations (hours)	.05	1190	448	26300	343	440	567	144	147
	.20	483	77.4	494	373	279	279	1080	346

(1) Illinois Pollution Control Board Standard

TABLE 19-28: CHANGES IN DISSOLVED OXYGEN LEVELS UNDER ALTERNATIVE TEST PLAN CONDITIONS

(All data in mg/l)	REACH			REACH		
	31			106		
	Existing	1st	2nd	Existing	1st	2nd
Maximum	12.9	12.9	12.9	13.0	13.2	
Minimum	2.1	2.16	2.64	4.0	4.56	
Mean	7.4	7.56	7.56	9.69	9.41	
* Violations	49	50	50	3	1	
Average Duration	25	21	21	18	33	
** Overall Assessment	Good	Good	Good	Good	Good	

*With respect to minimum state standard of 5.0 mg/l

**Based on percent of time D O levels were above 5.0 mg/l. Possible ratings are: Excellent, Good, Fair, Poor, and Bad

(All data in mg/l)	REACH			REACH		
	113			117		
	Existing	1st	2nd	Existing	1st	2nd
Maximum	14.0	14.0		13.8	13.5	
Minimum	5.7	3.75		3.3	2.8	
Mean	10.8	9.83		7.6	8.13	
* Violations	0	49		16	20	
Average Duration	0	2		26	33	
** Overall Assessment	Excellent	Good		Good	Good	

*With respect to minimum state standard of 5.0 mg/l

**Based on percent of time D O levels were above 5.0 mg/l. Possible ratings are: Excellent, Good, Fair, Poor, and Bad

TABLE 19-28: CHANGES IN DISSOLVED OXYGEN LEVELS UNDER ALTERNATIVE TEST PLAN CONDITIONS

(All data in mg/l)	REACH 121			REACH 270		
	Existing	1st	2nd	Existing	1st	2nd
Maximum	13.7	13.7		11.5	11.5	
Minimum	2.7	2.91		1.8	1.86	
Mean	10.0	8.82		8.6	8.02	
* Violations	16	2		17	21	
Average Duration	113	92		37	35.3	
** Overall Assessment	Fair	Good		Good	Good	

*With respect to minimum state standard of 5.0 mg/l

**Based on percent of time D O levels were above 5.0 mg/l. Possible ratings are: Excellent, Good, Fair, Poor, and Bad

(All data in mg/l)	REACH 300			REACH 310		
	Existing	1st	2nd	Existing	1st	2nd
Maximum	13.7	13.8		13.4	13.4	
Minimum	4.5	5.00		1.0	1.86	
Mean	10.3	10.3		9.0	9.07	
* Violations	1	1		73	62	
Average Duration	1	1		44	8.3	
** Overall Assessment	Good	Good		Fair	Good	

*With respect to minimum state standard of 5.0 mg/l

**Based on percent of time D O levels were above 5.0 mg/l. Possible ratings are: Excellent, Good, Fair, Poor, and Bad

TABLE 19-28: CHANGES IN DISSOLVED OXYGEN LEVELS UNDER ALTERNATIVE TEST PLAN CONDITIONS

(All data in mg/l)	REACH 340			REACH 360		
	Existing	1st	2nd	Existing	1st	2nd
Maximum	14.2	14.1	14.1	13.8	13.9	
Minimum	5.3	5.58	5.55	2.6	2.46	
Mean	10.1	9.96	9.97	8.86	8.91	
* Violations	0	0	0	15	17	
Average Duration	0	0	0	39	37.2	
** Overall Assessment	Excellent	Excellent	Excellent	Good	Good	

*With respect to minimum state standard of 5.0 mg/l

**Based on percent of time D O levels were above 5.0 mg/l. Possible ratings are: Excellent, Good, Fair, Poor, and Bad

(All data in mg/l)	REACH 370			REACH 430		
	Existing	1st	2nd	Existing	1st	2nd
Maximum	13.1	13.2		13.7	13.7	
Minimum	.05	1.44		1.7	1.69	
Mean	7.90	8.26		9.2	9.15	
* Violations	75	135		10	10	
Average Duration	54	13.4		27	26	
** Overall Assessment	Fair	Fair		Good	Good	

*With respect to minimum state standard of 5.0 mg/l

**Based on percent of time D O levels were above 5.0 mg/l. Possible ratings are: Excellent, Good, Fair, Poor, and Bad

TABLE 19-28 CHANGES IN DISSOLVED OXYGEN LEVELS UNDER ALTERNATIVE TEST PLAN CONDITIONS

(All data in mg/l)	REACH			REACH		
	480					
	Existing	1st	2nd	Existing	1st	2nd
Maximum	13.3	13.3				
Minimum	1.9	1.85				
Mean	9.4	8.89				
* Violations	97	192				
Average Duration	15	11				
** Overall Assessment	Fair	Fair				

*With respect to minimum state standard of 5.0 mg/l

**Based on percent of time D O levels were above 5.0 mg/l. Possible ratings are: Excellent, Good, Fair, Poor, and Bad

(All data in mg/l)	REACH			REACH		
	Existing	1st	2nd	Existing	1st	2nd
Maximum						
Minimum						
Mean						
* Violations						
Average Duration						
** Overall Assessment						

*With respect to minimum state standard of 5.0 mg/l

**Based on percent of time D O levels were above 5.0 mg/l. Possible ratings are: Excellent, Good, Fair, Poor, and Bad

TABLE 19-29: COMPARISON OF SOURCES AND VOLUMES OF POLLUTANTS
REACH 480

Pollutant Indicator and Source	Existing Conditions				First Test Plan				Pollutant Indicator and Source	Existing Conditions				First Test Plan			
	Surface		Ground		Surface		Ground			Surface		Ground		Surface		Ground	
	Amount	%	Amount	%	Amount	%	Amount	%		Amount	%	Amount	%	Amount	%	Amount	%
BOD (tons/yr.) Boundary Cond.	11400	72			4860	43			**Nitrate (tons/yr.)** Boundary Cond.	702	13			702	12		
Treatment Plants	1210	8			3820	35			Treatment Plants	177	4			665	12		
Comb. Sewer Over.	311	2			148	0			Comb. Sewer Over.	11.3	0			10.4	0		
Lowland	40.8	0	107	1	40.8	0	107	1	Lowland	2.02	0	612	12	2.02	0	612	11
Cropland	149	1	196	1	92.0	0	166	1	Cropland	83.8	2	1410	27	51.6	1	1230	21
Grassland	453	3	821	5	484	4	510	5	Grassland	86.9	2	2150	41	90.4	2	2370	41
Impervious	1170	7			1000	9			Impervious	19.5	0			16.7	0		
TOTAL	14700	93	1120	7	10400	93	783	7	TOTAL	1080	21	4170	79	1540	27	4210	73
Ammonia (tons/yr.) Boundary Cond.	126	12			126	8			**Phosphorous (tons/yr.)** Boundary Cond.	86.8	23			86.8	22		
Treatment Plants	620	59			1240	78			Treatment Plants	66	17			161	41		
Comb. Sewer Over.	24.4	2			23.2	0			Comb. Sewer Over.	6.83	2			6.50	0		
Lowland	2.60	0	5.64	1	2.6	0	5.64	0	Lowland	.18	0	16.5	4	.18	0	16.5	4
Cropland	29.7	3	9.78	1	18.4	1	8.27	1	Cropland	10.3	3	29.9	8	6.26	2	21.9	5
Grassland	113	11	87.6	8	121	7	37.5	2	Grassland	6.19	2	135	36	7.85	2	80.1	20
Impervious	39.5	4			33.4	2			Impervious	19.5	5			16.7	4		
TOTAL	956	90	103	10	1570	97	51.4	3	TOTAL	196	52	181	48	285	71	119	29

There were several reasons for the departure from the first test plan format. The most obvious is that some second test plan suggestions were incompatible. Another reason is that planning participants expressed a desire at this stage in the planning process to gain more understanding of the behavior and response of individual strategies. (It is impossible to determine the impact of an individual strategy if it is lumped together with others.)

The nine suggestions selected for the second test plan and their impacts on water quality are discussed below. Tables 19-28, 19-30 and 19-31 show the impact of suggestion number five on pollutant concentrations in Reaches 31 and 340 of the Basin. Other reaches were not simulated for water quality because the change in water quality from second test plan pollutant loads could be evaluated by inspection or was judged to be too small to significantly affect water quality.

1. Limit total phosphorous in all plant effluents below Johnsburg to 1 mg/l. Change concentrations in selected plants to the following:

Plant	Ammonia	Nitrate
Wauconda	1.5 mg/l	7.5 mg/l
Terra Cotta	1.5	7.5
Barrington	1.5	10.1
Lake Zurich	1.5	11.4
Crystal Lake 1,2,3	1.5	7.8
Elgin North	11.7	3.3
Elgin Main	3.9	9.9
Wasco	1.5	11.8
Batavia	10.0	1.6
Aurora	4.1	9.1

By limiting total phosphorous to 1 mg/l at all plants below Johnsburg, a reduction of 15 percent was calculated at the outlet of Fox River (Reach 480). By reducing the effluent concentration of ammonia to approximately 1.5 mg/l in plants below Johnsburg, there was a decrease in ammonia of 22 percent at the outlet of the Fox River. Nitrate increased by 7 percent to balance nitrogen in the plant effluents. A reduction in phosphorous may reduce the algae growth in the Fox River since phosphorous is the limiting nutrient for algae. The magnitude of this reduction in algae growth can have a beneficial effect on water quality. However, since point sources contribute less than half of the total phosphorous entering the basin, it is certain that even if all phosphorous were eliminated from point sources, severe algal blooms would still occur.

2. Reduce all municipal treatment plant flows by 15 percent to represent the effects of water conservation.

It was determined that reducing treatment plant flows by 15 percent would not significantly increase dissolved oxygen concentrations. The net flow decrease is about 1 percent. At the outlet, BOD, ammonia, and phosphorous would be reduced by 4, 10, and 5 percent respectively.

TABLE 19-30: WATER QUALITY EVENTS IN VIOLATION OF DESIRED LEVELS UNDER ALTERNATIVE TEST PLAN CONDITIONS

REACH 31

Pollution Indicator	LEVEL	Number of Violations			Average Duration of Violations (hours)			Percent of Time in Violation		
		Existing Conditions	1st Test Plan	2nd Test Plan	Existing Conditions	1st Test Plan	2nd Test Plan	Existing Conditions	1st Test Plan	2nd Test Plan
Temperature °C	32.2	6	0	0	2	0	0	0	0	0
Dissolved Oxygen as O, mg/l	5.0	49	50	50	25	21	21	5	4	4
BOD_{20} Carbonaceous as O, mg/l	10		98	91		33	36		12	12
Ammonia as N, mg/l	1.5	42	26	23	4	3	3	1	0	0
Nitrate as N, mg/l	10	0	0	0	0	0	0	0	0	0
Phosphorus Soluble as P, mg/l	.05	1	3	6	26300	8770	4370	100	100	100

REACH 106

Pollution Indicator	LEVEL	Number of Violations			Average Duration of Violations (hours)			Percent of Time in Violation		
		Existing Conditions	1st Test Plan	2nd Test Plan	Existing Conditions	1st Test Plan	2nd Test Plan	Existing Conditions	1st Test Plan	2nd Test Plan
Temperature °C	32.2	2	0		3	0		0	0	
Dissolved Oxygen as O, mg/l	5.0	3	1		18	33		0	0	
BOD_{20} Carbonaceous as O, mg/l	10		17			87			6	
Ammonia as N, mg/l	1.5	0	0		0	0		0	0	
Nitrate as N, mg/l	10	0	0		0	0		0	0	
Phosphorus Soluble as P, mg/l	.05	102	116		249	217		97	96	

REACH 113

Pollution Indicator	LEVEL	Number of Violations			Average Duration of Violations (hours)			Percent of Time in Violation		
		Existing Conditions	1st Test Plan	2nd Test Plan	Existing Conditions	1st Test Plan	2nd Test Plan	Existing Conditions	1st Test Plan	2nd Test Plan
Temperature °C	32.2	5	5		7	7		0	0	
Dissolved Oxygen as O, mg/l	5.0	0	49		0	2		0	0	
BOD_{20} Carbonaceous as O, mg/l	10		32			699			85	
Ammonia as N, mg/l	1.5	0	0		0	0		0	0	
Nitrate as N, mg/l	10	0	0		0	0		0	0	
Phosphorus Soluble as P, mg/l	.05	102	243		221	60		86	55	

TABLE 19-30 WATER QUALITY EVENTS IN VIOLATION OF DESIRED LEVELS UNDER ALTERNATIVE TEST PLAN CONDITIONS (Continued)

REACH 117

Pollution Indicator	LEVEL	Number of Violations			Average Duration of Violations (hours)			Percent of Time in Violation		
		Existing Conditions	1st Test Plan	2nd Test Plan	Existing Conditions	1st Test Plan	2nd Test Plan	Existing Conditions	1st Test Plan	2nd Test Plan
Temperature °C	32.2	3	4		5	4		0	0	
Dissolved Oxygen as O, mg/l	5.0	16	20		26	33		2	3	
BOD_{20} **Carbonaceous** as O, mg/l	10		50			119			23	
Ammonia as N, mg/l	1.5	121	11		95	4		44	0	
Nitrate as N, mg/l	10	0	0		0	0		0	0	
Phosphorus Soluble as P, mg/l	.05	39	139		672	66		100	35	

REACH 121

Pollution Indicator	LEVEL	Number of Violations			Average Duration of Violations (hours)			Percent of Time in Violation		
		Existing Conditions	1st Test Plan	2nd Test Plan	Existing Conditions	1st Test Plan	2nd Test Plan	Existing Conditions	1st Test Plan	2nd Test Plan
Temperature °C	32.2	0	0		0	0		0	0	
Dissolved Oxygen as O, mg/l	5.0	16	2		113	92		7	1	
BOD_{20} **Carbonaceous** as O, mg/l	10		26			621			61	
Ammonia as N, mg/l	1.5	0	0		0	0		0	0	
Nitrate as N, mg/l	10	0	0		0	0		0	0	
Phosphorus Soluble as P, mg/l	.05	133	13		141	1070		71	53	

REACH 270

Pollution Indicator	LEVEL	Number of Violations			Average Duration of Violations (hours)			Percent of Time in Violation		
		Existing Conditions	1st Test Plan	2nd Test Plan	Existing Conditions	1st Test Plan	2nd Test Plan	Existing Conditions	1st Test Plan	2nd Test Plan
Temperature °C	32.2	0	0		0	0		0	0	
Dissolved Oxygen as O, mg/l	5.0	17	21		37	35.3		2	3	
BOD_{20} **Carbonaceous** as O, mg/l	10	61	67		212	124		49	32	
Ammonia as N, mg/l	1.5	43	93		100	116		16	41	
Nitrate as N, mg/l	10	0	0		0	0		0	0	
Phosphorus Soluble as P, mg/l	.05	1	1		26300	26300		100	100	

TABLE 19-30 WATER QUALITY EVENTS IN VIOLATION OF DESIRED LEVELS UNDER ALTERNATIVE TEST PLAN CONDITIONS (Continued)

REACH 300

Pollution Indicator	LEVEL	Number of Violations			Average Duration of Violations (hours)			Percent of Time in Violation		
		Existing Conditions	1st Test Plan	2nd Test Plan	Existing Conditions	1st Test Plan	2nd Test Plan	Existing Conditions	1st Test Plan	2nd Test Plan
Temperature °C	32.2	1	1		4	4		0	0	
Dissolved Oxygen as O, mg/l	5.0	1	1		1	1		0	0	
BOD_{20} Carbonaceous as O, mg/l	10	192	158		38	45		28	27	
Ammonia as N, mg/l	1.5	28	25		4	4.3		0	0	
Nitrate as N, mg/l	10	0	0		0	0		0	0	
Phosphorus Soluble as P, mg/l	.05	15	21		1750	1250		100	100	

REACH 310

Pollution Indicator	LEVEL	Number of Violations			Average Duration of Violations (hours)			Percent of Time in Violation		
		Existing Conditions	1st Test Plan	2nd Test Plan	Existing Conditions	1st Test Plan	2nd Test Plan	Existing Conditions	1st Test Plan	2nd Test Plan
Temperature °C	32.2	1	2		10	6		0	0	
Dissolved Oxygen as O, mg/l	5.0	73	62		44	8.3		12	2	
BOD_{20} Carbonaceous as O, mg/l	10	53	37		407	531		82	75	
Ammonia as N, mg/l	1.5	1	1		26	26		0	0	
Nitrate as N, mg/l	10	0	0		0	0		0	0	
Phosphorus Soluble as P, mg/l	.05	20	187		1250	111		95	79	

REACH 340

Pollution Indicator	LEVEL	Number of Violations			Average Duration of Violations (hours)			Percent of Time in Violation		
		Existing Conditions	1st Test Plan	2nd Test Plan	Existing Conditions	1st Test Plan	2nd Test Plan	Existing Conditions	1st Test Plan	2nd Test Plan
Temperature °C	32.2	0	0	0	0	0	0	0	0	0
Dissolved Oxygen as O, mg/l	5.0	0	0	0	0	0	0	0	0	0
BOD_{20} Carbonaceous as O, mg/l	10	80	72	77	118	120	112	36	33	33
Ammonia as N, mg/l	1.5	30	23	23	59	70.7	71	7	6	6
Nitrate as N, mg/l	10	0	0	0	0	0	0	0	0	0
Phosphorus Soluble as P, mg/l	.05	16	16	18	1640	1640	1460	100	100	100

TABLE 19-30 WATER QUALITY EVENTS IN VIOLATION OF DESIRED LEVELS UNDER ALTERNATIVE TEST PLAN CONDITIONS (Continued)

REACH 360

Pollution Indicator	LEVEL	Number of Violations			Average Duration of Violations (hours)			Percent of Time in Violation		
		Existing Conditions	1st Test Plan	2nd Test Plan	Existing Conditions	1st Test Plan	2nd Test Plan	Existing Conditions	1st Test Plan	2nd Test Plan
Temperature °C	32.2	0	0		0	0		0	0	
Dissolved Oxygen as O, mg/l	5.0	15	17		39	37.2		2	2	
BOD_{20} **Carbonaceous** as O, mg/l	10	66	61		119	108		30	25	
Ammonia as N, mg/l	1.5	7	5		33	8.2		1	0	
Nitrate as N, mg/l	10	4	0		204	0		3	0	
Phosphorus Soluble as P, mg/l	.05	22	58		1190	448		100	99	

REACH 370

Pollution Indicator	LEVEL	Number of Violations			Average Duration of Violations (hours)			Percent of Time in Violation		
		Existing Conditions	1st Test Plan	2nd Test Plan	Existing Conditions	1st Test Plan	2nd Test Plan	Existing Conditions	1st Test Plan	2nd Test Plan
Temperature °C	32.2	2	1		7	10		0	0	
Dissolved Oxygen as O, mg/l	5.0	75	135		54	13.4		15	7	
BOD_{20} **Carbonaceous** as O, mg/l	10	72	41		246	477		67	74	
Ammonia as N, mg/l	1.5	10	3		34	50		1	1	
Nitrate as N, mg/l	10	0	0		0	0		0	0	
Phosphorus Soluble as P, mg/l	.05	1	75		26300	343		100	98	

REACH 430

Pollution Indicator	LEVEL	Number of Violations			Average Duration of Violations (hours)			Percent of Time in Violation		
		Existing Conditions	1st Test Plan	2nd Test Plan	Existing Conditions	1st Test Plan	2nd Test Plan	Existing Conditions	1st Test Plan	2nd Test Plan
Temperature °C	32.2	0	0		0	0		0	0	
Dissolved Oxygen as O, mg/l	5.0	10	10		27	26		1	1	
BOD_{20} **Carbonaceous** as O, mg/l	10	50	49		179	179		34	34	
Ammonia as N, mg/l	1.5	28	23		62	70		7	6	
Nitrate as N, mg/l	10	109	120		209	185		87	84	
Phosphorus Soluble as P, mg/l	.05	59	46		440	567		99	99	

TABLE 19–30 WATER QUALITY EVENTS IN VIOLATION OF DESIRED LEVELS UNDER ALTERNATIVE TEST PLAN CONDITIONS (Continued)
REACH 480

Pollution Indicator	LEVEL	Number of Violations			Average Duration of Violations (hours)			Percent of Time in Violation		
		Existing Conditions	1st Test Plan	2nd Test Plan	Existing Conditions	1st Test Plan	2nd Test Plan	Existing Conditions	1st Test Plan	2nd Test Plan
Temperature °C	32.2	25	24		6	7		1	1	
Dissolved Oxygen as O, mg/l	5.0	97	192		15	11		6	8	
BOD_{20} Carbonaceous as O, mg/l	10	47	20		449	1090		80	83	
Ammonia as N, mg/l	1.5	1	1		34	35		0	0	
Nitrate as N, mg/l	10	0	0		0	0		0	0	
Phosphorus Soluble as P, mg/l	.05	166	163		144	147		91	91	

TABLE 19-31 COMPARISON OF POLLUTANT CONCENTRATIONS, EXISTING CONDITIONS – FIRST TEST PLAN – SECOND TEST PLAN

Water Quality Indicators	Standard(1) (or other level)	REACH			REACH		
		31			340		
		Existing	1st	**2nd	Existing	1st	**2nd
BOD (mg/l) Maximum	None	30.8	22.9	22.9	117	96.2	97.4
Minimum		1.1	.94	.94	1.4	.78	.78
Mean		6.3	5.43	5.43	16.4	13.2	13.3
Ammonia (mg/l) Maximum		4.9	4.51	3.63	2.7	2.67	2.68
Minimum		.1	.05	.05	.1	.03	.03
Mean		.5	.30	.30	.5	.43	.43
Frequency of Violation	(1) 1.5	42	26	23	30.0	23	23
Average Duration of Violations (hours)	(1) 1.5	4	3	3	59.0	70.7	71
Nitrate (mg/l) Maximum	None	5.8	7.13	7.16	.1	9.00	9.00
Minimum		.5	.49	.49	.1	.06	.06
Mean		3.1	3.84	3.84	7.9	7.72	7.71
Frequency of Violation	10.0	0	0	0	0	0	0
Average Duration of Violations (hours)	10.0	0	0	0	0	0	0
Phosphate (mg/l) Maximum		1.2	1.90	1.53	1.9	1.85	1.86
Minimum		.1	.05	.05	0	.02	.02
Mean		.3	.27	.27	.4	.24	.24
Frequency of Violation	.05	1	3	6	16.0	16	18
	.20	99	115	132	86.0	143	144
Average Duration of Violations (hours)	.05	26300	8770	4370	1640	1640	1460
	.20	214	184	76	296	83.2	83

(1) Illinois Pollution Control Board Standard

**Data are from the second simulation of the 2nd Test Plan

3. Reduce phosphate loads at point sources by 50 percent of existing condition (1976) conditions to represent a more stringent ban on phosphate detergent.

   The more stringent phosphate ban would reduce phosphorous by 9 percent more than the first test plan at the outlet. (It is important to note that the 9 percent reduction does not include any reduction of phosphorous between existing conditions and the first test plan).

4. Return ammonia and nitrate to existing conditions in the effluent for the Hebron, Richmond, Woodstock North, Valley High Nursing Home, and Fox Lake treatment plants.

   Returning ammonia concentrations to existing levels for the municipal plants above Johnsburg would have a significant effect on water quality. Ammonia would increase by 79 percent at the outlet of the Chain of Lakes. At the outlet of the Fox River, ammonia would increase by 15 percent.

5. Model Nippersink Creek upstream of Wonder Lake and Tyler Creek with the following changes from the first test plan:
   a. Assign all marginal cropland to the lowland (meadow) category;
   b. Reduce agriculture grassland surface loadings by 25 percent.

   There would be virtually no change in Nippersink Creek or Tyler Creek from Instruction 2. In Nippersink Creek, there would be an increase in the minimum DO event from 2.16 to 2.64 mg/l. Also, the peak ammonia and phosphate levels decreased. Although grassland represents 45 percent of the area upstream of Wonder Lake tributary to Nippersink Creek, the modifications would affect less than 10 percent of the loads of BOD, NH_3, NO_3, and PO_4. Therefore, little change could be expected.

6. Remove or slot dams below McHenry Dam.

   As seen in the report titled Lowhead Dams and Their Effects on Water Quality by Hydrocomp, Inc., (October, 1977), dams have a significant effect on water quality. Removal of certain dams on the Fox River would increase the amount of dissolved oxygen. In the Hydrocomp report, removal of two dams on the Des Plaines River increased the mean from 5.9 to 8.1 mg/l. Also, the minimum and maximum events increased. The removal of dams would increase the assimilative capacity of the river by increasing river velocity.

7. Reduce phosphorous concentrations in the Fox River entering Illinois at the Wisconsin border to 0.05 mg/l.

   Reducing phosphorous to a level of 0.05 mg/l entering the Chain of Lakes from Wisconsin most likely will ease the algae problems in these lakes. There is a reduction of 46.2 tons per year of phosphorous as compared to existing conditions. At the outlet of the Chain of Lakes, this reduction will represent a decrease of approximately 30 percent of all phosphorous. As stated in the 1977 report, Fox Chain of Lakes Investigations and Water Quality Management Plan by the State Water Survey, reduction in present nutrient contributions will be required if the waters of the Chain of Lakes are to be improved. Lack of either nitrogen or phosphorous effectively curbs algal growth. Since algae can fix nitrogen from the atmosphere, controlling the availability of phosphorous in the waters appears to be the most effective procedure for control.

8. Represent a 50 percent reduction in the population increase for the year 2000 assumed in the first test plan.
   A 50 percent reduction in population increase in the Fox River basin will not have a major effect on flow in the watershed. Flow would be decreased by about 2 percent. However, the constituents directly or indirectly contributing to oxygen depletion are reduced by 5 percent for BOD, 7 percent for phosphorous, and 15 percent for ammonia. The decrease in loads will tend to improve water quality in the system.

19.09 PROBLEM ASSESSMENT

The previous sections have presented information on the current water quality of the Fox River basin, sources of pollution, and alternative proposals for improving water quality. This section will attempt to assess the problems noted in these sections and discuss their roles in the development of recommendations to improve water quality in the Fox basin.

a. Water Quality Sampling Data

In-stream sampling data indicated problems with respect to phosphorous, fecal coliform, and copper throughout the Fox basin. Violations of the lead, iron, and silver standards were also noted. Ammonia violations were noted on Flint Creek and at the outlet of Crystal Lake near Algonquin. SOD sampling results indicated that the benthic condition of the basin was generally slightly degraded to moderately polluted. Heavy pollution was noted near Aurora. Biological classification of the SOD samples indicated moderate to severe pollution using Shannon-Weaver indices and semi-polluted to polluted conditions using IEPA rankings. Dam aeration-deaeration studies indicated the deleterious effect on water quality of channel dams on the Fox River.

b. Computer Simulation of Existing Conditions

Water quality in the Fox River is generally fair to good as simulated for existing conditions. Pollutant loads are relatively low, overall. The major sources of pollutants in order of magnitude are boundary conditions (Wisconsin), point sources, and stormwater runoff.

The ability of the Fox River to assimilate pollutant loads is determined, to a large extent, by its hydraulic configuration. Numerous lakes (Chain of Lakes) and low-flow pools behind dams create a very long flow-through time in the system. Flow velocities are quite low, resulting in relatively low reaeration potential and the deposition of suspended solids. Algal populations, abundant because of excess nutrients, have a strong influence on dissolved oxygen conditions. In general, dissolved oxygen problems tend to be related to low flow in the mainstem Fox and related to wet weather in the tributary reaches, with more severe violations in the mainstem reaches. Violations of the ammonia standard are infrequent in most reaches but may be severe in certain tributaries. Eutrophication is a major problem in the impounded reaches. High water temperature is also a problem in several reaches, this again being related to the hydraulic regime of the river.

Maximum concentrations of nitrate / nitrogen in excess of 10.0 mg/l were simulated for Poplar Creek (Reach 360) and Otter Creek (Reach 430). Nitrate concentrations may be a serious problem, since these concentrations exceed the allowable limit for a drinking water supply and since the City of Elgin is considering the Fox as a water supply source. This Commission's Regional Water Supply Plan also recommends the Fox as a water supply source.

c. Point Sources - Existing Conditions

Facilities Planning

Facilities planning is underway but has not received final approval in the FPAs of Aurora, South Dundee Township, Sanitary District of Elgin, Lake Zurich, Eastern Kane, Sugar Grove, and Wauconda. Needs analysis reports were prepared for the FPAs of Southeastern McHenry, McHenry, Richmond, Gilberts, Pingree Grove, Sunnyside/Spring Grove, Wonder Lake, Burlington, Wayne, and the Sanitary District of Wasco. The Cary and Crystal Lake FPAs (formerly part of the now defunct Southeastern McHenry FPA) have applied for funds to do supplemental step 1 planning. The other needs analysis areas may also require further study in varying degrees of complexity. Infiltration/inflow analyses have been completed or are underway for all sewered FPAs, except Algonquin (formerly part of Southeastern McHenry), McHenry, and Richmond. Facilities planning exceptions, under Title 40 CFR 35.917(e), were granted to the Batavia, Carpentersville and Northwest Lake FPAs. It is possible these areas could apply for grant funds to complete formal facilities planning. In the

MSDGC area, Hoffman Estates and Schaumburg have not completed sewer system evaluation surveys (SSES) to supplement the completed MSDGC I/I study. The question of which plants in the Fox River basin will require ammonia removal apparently will be resolved by the IEPA on a case by case basis.

Non-Municipal Point Sources

The future status of privately owned municipal type, miscellaneous, industrial, and other facilities is unknown.

Combined Sewer Overflows

Combined sewer overflows occur from the Sanitary District of Elgin, the Aurora Sanitary District and the Batavia FPAs. Plans for control of pollution from these sources is underway but, in the case of the Sanitary District of Elgin and the Aurora Sanitary District, have not yet been funded. The relatively low priorities of these projects could present a problem in funding and the attainment of desired water quality in certain reaches of the basin.

d. Nonpoint - Existing Conditions

Potential problem sources of nonpoint pollution in the basin include stormwater sewer systems, construction activities, septic systems, mining, surface waste disposal sites, hydrologic modifications, agricultural runoff, and marine activities.

Impervious surfaces are forecasted to increase by 32 percent in the basin, causing a proportional increase in stormwater runoff. Croplands and grasslands taken together are expected to remain relatively unchanged. There are approximately 22,000 septic systems (52 percent of the basin total) in the basin which have been located in areas having limitations for disposal. The impact of these systems on ground and surface waters is not precisely known. The 14 dams in the basin have a negative impact on DO concentrations and on water quality in general.

e. Boundary Conditions

Boundary conditions have been shown to be one of the major pollutant sources in the basin, contributing 72 percent of the BOD, 12 percent of the ammonia and 23 percent of the phosphate entering the basin.

f. Residuals

There is a general lack of detailed, reliable, data on the generation and disposal of residuals from point sources and septics in the basin.

g. Problems Remaining After Implementation of the 208 Plan

The in-stream phosphorous standard of .05 mg/l will never be met by point source improvements and changes in boundary conditions in the basin. Consequently, algae problems will also never completely be eliminated in the basin. The reason for this is that point sources and boundary conditions contribute less than half of the total phosphorous reaching the basin and controls on these sources cannot solve the phosphorous problem. For this reason, it appears that phosphorous removal at point sources below Johnsburg Road which are not immediately tributary to a lake or reservoir would be impacticable. Phosphorous removal to 1 mg/l at point sources tributary to the Chain of Lakes or a lake or reservoir should continue. Since it is not known at what concentrations of phosphorous algae problems would peak, it is necessary to continue to remove phosphorous above Johnsburg Road to prevent algae problems in the Chain of Lakes from becoming worse.

Water quality in Reaches 370 and 480 remains only fair after implementation of all proposals in the first and second test plans. However, both reaches are very close to being classified as good, which requires meeting the Do standard of 5 mg/l, 95 percent of the time. Possible alternatives not tested which could achieved the necessary improvement in water quality in Reaches 370 and 480 would be the slotting of dams to increase the Fox River's flow velocity (and thereby its assimilative capacity) and requiring stricter treatment standards so effluents meet 10 mg/l BOD_5 and 12 mg/l suspended solids at all municipal point sources. However, in view of recent declining population forecasts for the basin and the fact that point sources contribute 30 percent of the BOD in Reach 370 and 35 percent of the BOD in Reach 480, it is probable that pollutant loads to these reaches will be less than those assumed in the 208 modeling work. Reductions in population will have a corresponding impact on wastewater flows. Municipal plants would operate at less than design capacities and would produce better quality effluent than was assumed. This would probably result in both Reaches 370 and 480 reaching desired water quality objectives. Therefore, no additional measures are proposed at this time, except that the situation be closely monitored under the continuing planning program.

Maximum nitrate concentrations in excess of 10.0 mg/l continue to be simulated under both test plans for tributary reaches to the Fox (340 and 430) above and below Elgin. With the greater nitrification proposed in the second test plan to meet the in-stream water quality standard of 1.5 mg/l ammonia, the concentrations of nitrate may be even higher. The prime source of nitrate in these reaches is groundwater. The nitrate enters the groundwater from fertilizer applications to cropland and from the breakdown of livestock wastes on pastures. Since no violations of the nitrate limitation were simulated on the mainstem of the Fox, where water supplies would be drawn, the suitability of the river as a water supply source is not affected at this time. However, the problem of high nitrate levels on tributaries should be studied further.

19.10 THE RECOMMENDED PLAN FOR THE FOX RIVER BASIN

a. Overview of the Recommended Plan

Recommended measures for improving and protecting water quality in the Fox River basin are derived from the recommendations in Chapters 5-8 of the areawide plan, but are tailored to the specific problems in the basin. Of particular importance are the serious impacts of treatment plant discharges and the wet weather pollution from pervious and impervious surfaces. The effects of combined sewer overflows in the Kane County portions of the basin also must be eliminated.

Implementation of local facilities plans should reduce problems from treatment plant effluents and eliminate combined sewer overflows. It is imperative, however, that actual performance be consistent with plan provisions.

Additional measures, such as reduction of wastewater flows and post-treatment aeration also are recommended in this basin. Aeration should help correct the low DO levels simulated in some reaches.

Recommendations with respect to nonpoint sources are basically the same as the overall program outlined in Chapter 6. Control of polluted runoff from urban development sites is of critical importance in this basin, because of the extensive development forecast for this area.

Recommendations

1. Point Sources

1.1 Municipal Wastewater Treatment Plants

1. Municipal treatment authorities, as listed below, will implement their respective portions of all 201 plans as indicated and on the time schedules shown in the NIPC 201 assessments as summarized in paragraph 19.04 and as noted below. (List of treatment authorities is basin specific.)

Village of Algonquin
Village of Antioch
Village of Barrington
City of Batavia
City of Crystal Lake
Village of East Dundee
Village of Elburn
Village of Fox Lake
Village of Fox River Grove
City of Geneva
Village of Hebron
City of St. Charles
Village of Sugar Grove
Village of Wauconda
Village of West Dundee
Community of Wonder Lake
City of Woodstock
Metropolitan Sanitary District of Greater Chicago
Aurora Sanitary District
Sanitary District of Elgin
Island Lake Sanitary District

Village of Lake Villa
Village of Lake Zurich
City of McHenry
Village of McHenry Shores
Village of Richmond
Lake County Public Works Dept.
Lake in the Hills Sanitary District
Round Lake Sanitary District
Wasco Sanitary District

Recommended changes to the 201 plans including the following:

1. The separately sewered municipalities of Hoffman Estates and Schaumburg should seek federal grant funds to undertake sewer system evaluation surveys as required by 40 CFR 35.927 to supplement the completed MSDGC I/I studies.

2. Chapter 3, Water Pollution, Section 407(b) of the Illinois Pollution Control Board Rules and Regulations should be modified to read as follows:

   "No effluent from any point source which is tributary to the Chain of Lakes and whose untreated waste load is 1,500 or more population equivalents shall contain more than 1.0 mg/l of phosphorous as P after the date this plan goes into effect. Point sources below Johnsburg Road not immediately tributary to a lake or reservoir need not provide phosphorous removal after that date."

   This recommendation does not affect the state water quality standard of .05 mg/l total phosphorous for streams as they enter a lake or reservoir.

3. As soon as possible, the municipalities of Gilberts, Spring Grove, Sunnyside, Wayne, Burlington, Pingree Grove and the community of Wonder Lake should submit grant applications to complete supplemental Step I studies to augment their completed needs analysis reports. These supplemental studies should identify any specific problems with existing septic systems and recommend financially feasible solutions to be implemented by the aforementioned communities or their individual citizens.

4. All municipalities and the six counties should seek to achieve continued reductions in water use in order to conserve water resources and to reduce wastewater flows at all publicly owned treatment plants. This should be accomplished through modification of building codes to require water conserving plumbing fixtures, metering of all new development, pricing policies, and public education to reduce consumption in already developed areas.

5. By July 1, 1983, all treatment plants whose 7-day, 10-year low-flow dilution ratio is 10 to 1 or less shall provide or continue to provide not less than 80 percent oxygen saturation in their effluents. Monitoring of wastewater quality after aeration will be conducted.

6. Municipal type wastewater service required to serve future growth within the service areas identified for the year 2000 should be provided only by treatment authorities designated in this plan, except where this is not practical or cost-effective.

7. In any application for issuance or amendment of a NPDES permit, each designated treatment authority should delineate its projected 5-year service area for which treatment capacity is in place or under construction consistent with agreed regional population forecasts.

8. No NPDES permit will be issued for municipal type wastewater service within the 5-year service area delineated in the permit, other than to the treatment authority, except on a finding by IEPA that the proposed facility (1) is the most cost-effective means of providing service or (2) is an interim facility pending extension of service by the treatment authority.

9. The treatment plant operators of the wastewater treatment authorities listed in Item 1, will assure the very high standard of performance for wastewater treatment plants which the 201 plans assume. The IEPA will monitor treatment plant operation and performance and its effect on in-stream water quality. IEPA should establish a technical assistance program to aid operators and laboratory technicians of small public and private treatment plants in dealing with technical problems and assuring a consistent high level of performance in treatment operations.

10. As part of the continuing planning program, the IEPA, in conjunction with local governments, should maintain an adequate in-stream and effluent monitoring program including chemical, physical, and biological components to assure the effectiveness of the 208 plan. Both the IEPA and NIPC should periodically review the monitoring program to assure its adequacy, and the continuing planning program should recommend any needed monitoring changes to more effectively assess progress in implementing the 208 plan.

11. In-stream water quality data collected by local treatment plant operators will be periodically published by IEPA.

12. By July 1, 1980, all municipalities and counties will enact ordinances banning the sale of high phosphate home laundry detergents.

    NPDES permits issued by IEPA to private utility companies will identify projected 5-year service areas. No other NPDES permits will be within those 5-year service areas to other treatment authorites except upon a finding by the IEPA that the proposed facility is the most cost effective means of providing service; is an interim facility pending extension of service by another established treatment authority; or is intended to serve an isolated location.

1.2 Industrial Wastewater Treatment Plants

1. The IEPA shall continue to enforce all requirements of NPDES permits for all industries in the basin and assure that treatment plants achieve and maintain required standards of plant performance. This can be achieved through IEPA standards for treatment plant personnel and through frequent sampling and analysis of treatment plant effluent by the IEPA for the purpose of monitoring compliance with NPDES permits.

2. The United States Environmental Protection Agency and the IEPA will assure that the pretreatment requirements established under Section 307(b)(1) of PL 92-500 are implemented by local treatment authorities which receive industrial wastes. Effluent standards for direct industrial wastewater dischargers prescribed by Section 306 and 307(a) of PL 92-500 will be implemented by IEPA.

1.3 Miscellaneous Wastewater Treatment Plants

Miscellaneous publicly and privately owned wastewater treatment plants will continue in operation until such time was wastewater service can be provided by publicly owned municipal type wastewater systems on a cost-effective basis. Service areas of privately owned treatment systems shall not be expanded when service can be provided on a cost-effective basis for publicly owned municipal type wastewater systems.

The IEPA will continue to enforce all requirements of NPDES permits and assure that treatment plant operators achieve required standards of plant performance.

1.4 Combined Sewer Overflows

When grant funds are offered, combined sewer overflows from the Aurora Sanitary District, the Elgin Sanitary District and Batavia will be controlled as outlined in their respective facilities plans. It is imperative that these plans be implemented if desired water quality is to be achieved.

2. NONPOINT SOURCES

2.1 Urban Stormwater Runoff

1. By July 1, 1983, the six counties and all municipalities should implement measures to reduce pollutants from stormwater runoff in already urbanized areas by a minimum of 25 percent and in newly urbanizing areas by a minimum of 50 percent of present 1976 surface loadings on impervious areas. The implementing agencies should work through the county water quality committee to develop plans and standards for the implementation of street cleaning and

catch basin cleaning programs, performance zoning, use of pervious pavement surfaces, increased vegetation cover, grass waterways, wetland storage of stormwater, stormwater detention, sedimentation and erosion control, and other appropriate measures to achieve the desired pollutant reductions.

2. By July 1, 1980, the six counties and all municipalities in the basin will enact stormwater detention regulations to limit the rate of runoff from newly urbanized areas. The county water quality committees will aid in achieving consistency between local ordinances and determine the minimum standards. By July 1, 1979, NIPC will prepare a model detention ordinance for use by local governments.

3. By July 1, 1980, the six counties and all municipalities in the basin will enact soil erosion and sedimentation control ordinances to control runoff and sedimentation from land disturbance activities. The county water quality committees will aid in assuring consistency between ordinances. By July 1, 1979, NIPC will prepare a model ordinance for use by local governments.

4. By July 1, 1980, the six counties and all municipalities in the basin will adopt measures to control surface runoff from open storage yards containing industrial stockpiles and other materials which may go into solution or which may be carried away by stormwater runoffs and pollute streams and other water bodies. By July 1, 1979, NIPC will prepare a model surface runoff ordinance for use by local governments.

5. By July 1, 1979, municipalities, townships, counties, and state and county highway departments responsible for de-icing streets and highways should develop programs to control the application of de-icing materials, to train personnel in proper application methods, and to use proper equipment in order to minimize any negative water quality impacts. The impact of de-icing on water quality will be given further study by NIPC in the continuing planning program.

2. Agricultural Runoff

1. By July 1, 1979, the six counties in conjunction with agencies of the United States and Illinois Departments of Agriculture and the county water quality committees, will identify the best management practices necessary to implement the agricultural aspects of the 208 plan, including tillage, contour plowing, terracing, and conversion of cropland to grassland. They will also identify those areas in which the best management practices should be applied, and they will use available cost-sharing and

technical assistance programs to insure implementation according to the flowing schedule on approximately 140,700 acres of land:

By 1985 - 30% of the identified land
By 1995 - 70% of the identified land
By 2000 - 100% of the identified land

The IEPA and NIPC will provide the results of their in-stream water quality monitoring to the Soil and Water Conservation District and to the Departments of Agriculture so that priority can be given to the areas most sensitive from a water quality standpoint in order to maximize the impact of the best management practices.

2. The IEPA will enforce the IPCB regulations which require permits for feedlots and the IEPA draft technical policy WPC-2 "Design Criteria for Field Application of Livestock Wastes."

3. Illinois Department of Agriculture, Illinois Department of Public Health, and USEPA regulations on the use of pesticides and disposal of containers, and Illinois Department of Agriculture regulations on the training and licensing of pesticide applicators and operators should be continued.

4. Farmers should implement good pasture management practices, utilize grass waterways, vegetative filter strips, and field borders, and make wise use of fertilizers whereever possible in accordance with the Illinois Agronomy Handbook to reduce the dangers of pollution. The U.S. Department of Agriculture agencies should help farmers recognize the water quality problems posed by improper practices, and educate them in the use of proper practices.

5. By July 1, 1979, the county water quality committees in conjunction with agencies of the U.S. and Illinois Departments of Agriculture will identify localized pollution problems resulting from cattle grazing. By July 1, 1978, NIPC, as part of its continuing planning responsibilities, should recommend measures for the correction of those problems through established programs.

3. Other Nonpoint Sources

1. On-site Disposal Systems

1. Individual malfunctioning on-site disposal systems outside the 5-year service areas identified under Item 1.7 should be repaired wherever possible upon complaint to the appropriate county authorities or replaced with a new system if necessary. By July 1, 1983, special service areas should be established, where necessary, under sponsorship of the counties to aid in the financing of any cluster septic systems or other on-site

improvements necessary to correct or replace malfunctioning systems in areas outside the 5-year projected service areas.

2. The six county health departments should allow new on-site systems only in areas where soil conditions are appropriate. The minimum requirements of the Illinois Private Sewage Disposal Code should be upgraded to require more innovative site analysis techniques, and Cook and Will County Health Departments should require a construction permit to regulate the design, location, and installation of every new on-site system in incorporated as well as unincorporated areas.

3. By July 1, 1980, the six counties should initiate permit programs for on-site wastewater disposal systems. Installation permits should carry a renewal provision that requires inspection not less than every 5 years by appropriate county or municipal agencies. As local authorities receive complaints on malfunctioning units, permits should be issued after inspection to ensure that all necessary corrective measures have been taken. Permits would be renewable every 5 years in the same manner as permits for new systems.

4. By July 1, 1980, the six county health departments should identify those on-site systems which discharge effluents into farm tile systems and require repair or replacement to eliminate the discharges.

2. Air Pollution

As part of the continuing planning program, the IEPA, in cooperation with the Illinois Institute for Environmental Quality, the Illinois Water Survey, and local air quality management agencies, should analyze the relationship between air pollution and water quality in all of its aspects. The IEPA should cooperate with NIPC in devising strategies for correcting present negative effects and preventing future problems through the 208 continuing planning program.

3. Sanitary Landfills

The IEPA will ensure that every sanitary landfill complies with all regulations of the IPCB for its siting, design, construction and operation. As a substitute for existing state regulations, the IEPA and IPCB should consider certification of local solid waste disposal programs which comply with areawide plans prepared under the Federal Resource Conservation and Recovery Act. Alternatives to land disposal of solid wastes, including recycling, should be considered and utilized wherever feasible.

4. Waterways

1. Given the high nutrient concentrations in the Fox River, the county water quality committees should give serious consideration to the potential negative water quality impacts of impoundments which might be constructed by IDWR, the Corps of Engineers, or any other government entity pursuant to the flood control recreation plan for the Fox River.

2. The Illinois Division of Water Resources, the IEPA, and the county water quality committees should assess any dredging proposals against the requirements of the 208 plan, because, except for the removal of benthic deposits, dredging operations typically provide little water quality benefit and cause serious disruptions in the aquatic environment. The possible negative impacts on water quality should be assessed against the flood control, drainage, or navigation benefits of any proposed dredging project.

3. NIPC, in conjunction with the county water quality committees in the continuing planning program, should develop recommendations to simplify the highly fragmented system for channel maintenance and improvement in the Fox River and its tributaries. Present responsibility for such maintenance functions as debris removal, streambank stabilization, public access, dredging, disposal of dredge spoil, protection and augmentation of habitat, tree shading and vegetation, is shared between a host of federal, state, and local authorities.

4. The counties are encouraged to develop an organization similar to the Cook County Clean Stream Committee, consisting of volunteers and organization representatives who maintain surveillance over water bodies for activities adverse to water quality, flood control, recreation, fish, wildlife, and/or navigation.

5. The feasibility of slotting dams on the Fox River to improve water quality and provide flood control benefits will be examined in the continuing program in cooperation with the Corps of Engineers and their continuing study of the water resources of the Fox River.

3. BOUNDARY CONDITIONS

The USEPA, the Wisconsin Department of Natural Resources, and the Southeastern Wisconsin Regional Planning Commission, should assure that the Fox River as it flows into Illinois will meet the prescribed boundary water quality standards which require a minimum dissolved oxygen concentration of 5.0 mg/l 95 percent of the time, a mean BOD_5 concentration of 4.0 mg/l, a maximum ammonia nitrogen concentration of 1.5 mg/l, and the goal for the concentration of phosphorous as P is 0.05 mg/l.

4. RESIDUALS

1. As regulated by the IEPA, present methods for the disposal of sludge from treatment plants are adequate to handle present and anticipated future volumes and should continue to be effectively administered by the IEPA. The MSDGC sludge disposal plan is under evaluation by the District and should be completed by July 1, 1980.

2. Highest priority should be given to the use of sludge as a soil conditioner and to the expansion of efforts to utilize sludge for that purpose. The IEPA should assure proper practices in the utilization of sludge on agricultural lands thorugh implementation of the draft standards in IEPA Technical Policy WPC-3 "Design Criteria for Municipal Sludge Utilization on Agricultural Land."

3. The preferred method for the disposal of domestic septage is land application, and this method should be encouraged and used whenever possible. Recognizing a continuing need for the disposal of large volumes of septage at wastewater treatment plants, specific facilities should be designated by the IEPA to receive domestic septage on recommendation by NIPC through the continuing planning process.

4. Any program for the disposal of septage should provide for a sampling program to properly monitor the content of the wastes being disposed of. If the sampling indicates the presence of toxic and/or hazardous wastes, they should be disposed of at IEPA designated landfills, and the source of the toxic or hazardous wastes should be reported to the IEPA by the septage hauler.

5. The USEPA standards and the IPCB regulations for permits for disposal of hazardous or toxic substances should continue to be enforced by the IEPA.

5. GROUNDWATER

By July 1, 1980, the Illinois State Water Survey and the Illinois State Geological Survey should undertake a coordinated well sampling program to monitor groundwater quality in areas where a potential for infiltration by pollutants now exists or might exist in the future.

6. INLAND LAKES

By July 1, 1979, in accordance with Section 314 of PL 92-500, the IEPA should undertake expanded lake sampling to identify eutrophic conditions and, in conjunction with NIPC and the county water quality committees, develop a plan to control sources of pollution and restore water quality.

7. MINING

The presence IPCB regulations for control of pollution from aggregate producing activities are considered generally satisfactory. However, the IEPA should continue to study the types and volumes of pollutants associated with mining activities and their potential effects on surface and groundwater quality. Any needed changes in present regulations should be identified by July 1, 1980.

19.11 COSTS OF RECOMMENDED PLAN

a. Facility Plans

1. General

Table 19-32 shows pertinent capacities in the year 2000 for surviving wastewater treatment plants, their effluent standards, and construction costs. Local collector sewer projects are shown, if they have been processed for federal or state grants. Also shown are total MSDGC costs allocated to this basin.

Cost data were assembled from various sources as noted below and in the tables that follow. The processing of this information and its allocation to the North Branch basin are described, where applicable.

Except for the MSDGC area, initial costs of facility plans listed in Table 19-32 apply to the first phase of any project which is to be followed at some future date by programmed expansions or extensions. Under this definition, the total cost of works currently under construction fall under the classification initial even though the project has not yet been completed and future payments to contractors will be made. Except for the MSDGC area, future costs in Table 19-33 cover phased work scheduled at later dates.

2. MSDGC Area

Because of their magnitude and complexity, special procedures were followed in depicting MSDGC costs.

Total costs of MSDGC improvements and locally funded improvements were taken from Table U7-IX-1 and from page 229 in the MSDGC's 1977 Facilities Plan Update Supplement. They were revised and brought up to date in a conference with MSDGC staff representatives on March 14, 1978.

The cost of all MSDGC improvements was assumed to be spread throughout the MSDGC service area on an ad valorem basis. Thus, each basin's share of the cost was assumed to be proportional to the share of total district assessed valuation in that basin.

For locally funded improvements, the estimates for local sewer upgrading are current 1977 values (from page 229 of the MSDGC 1977 Plan Update Supplement). For other local improvements, the estimates in pages XI-18 and XI-19 of the MSDGC overview report are as of January 1, 1975 (also updated). Where applicable, costs were also updated at 6 percent compounded for the intervening period to January 1977 levels.

The costs of local improvements were allocated differently, depending upon the particular type of project. Local sewer upgradings required as supplements to the Tunnel and Reservoir Plan (TARP) apply only to the 49 communities in the TARP area. A basin's share of the total cost of these upgradings was assumed to be equal to the percentage share of the total TARP area assessed valuation in TARP communities in that basin.

For local sewer improvements outside the TARP area, the costs were allocated to non-TARP communities in each basin in accordance with their share of the total assessed valuation for all non-TARP areas.

3. Phasing and Operating and Maintenance Costs

Table 19-33 distributes capital costs within 5-year time frames. Annual operating and maintenance costs are also shown, which are based on data included in current reports, where available, or from data furnished by operating agencies. In their absence, they were estimated based on information in Staff Paper No. 20, Wastewater Treatment Processes and Cost Data.

The cost for bonded indebtedness of previous system improvements is not included in the operating and maintenance costs listed in Table 19-33.

The costs for constructing TARP II are included in Table 19-33.

Construction costs do not differentiate between grant eligible and local shares.

4. Local Costs

Table 19-34 shows annualized local capital costs.

5. Increased Costs

Table 19-35 shows the estimated annual increases in wastewater charges per household for residents in the basin by county and for the basin as a whole for the previously described improvements and/or expansions.

b. Point Sources

Costs for proposals contained in existing facilities plans and needs analysis reports are highlighted in Table 19-17d. Reductions in water use could result in possible reductions in capital and annual operation and maintenance costs for wastewater treatment facilities, depending upon the amount of water use reduction achieved and its corresponding impact on wastewater flows. However, it is impossible to quantify the cost savings. The additional cost for installation of post-treatment aeration facilities will vary greatly depending on the configuration of existing systems and is impossible to accurately estimate. The cost to extend sewers to serve future growth is either included in existing facilities plans or will be borne by developers. The costs for high performance operation of wastewater treatment facilities is included in existing facilities plans. Continued in-stream sampling and monitoring is not expected to require any additional costs beyond those incurred by the state and local goverments for water quality monitoring. A ban on the sale of high phosphate laundry detergent will have minor administrative costs and will probably slightly raise the prices of detergent, but these costs have not been estimated. The elimination of the 1 mg/l phosphorous removal requirement for plants not tributary to the Chain of Lakes would result in a capital cost savings of $4.27 million and an annual operating and maintenance cost savings of $2.35 million. Plants which will no longer require phosphorous removal are shown in Table 19-32. Costs in Tables 19-32 and 19-33 reflect these savings. The additional costs for sufficient nitrification to enable plants to meet the in-stream water quality standard of 1.5 mg/l are impossible to estimate. Secondary treatment processes vary throughout the basin, and each accomplishes a varying amount of nitrification which can be determined only by sampling. In addition, the wastewater load to a plant in relation to plant capacity affects the degree of ammonia removal. A further problem is that the plants need not discharge an effluent containing 1.5 mg/l but rather one which does not cause in-stream ammonia concentrations to exceed 1.5 mg/l beyond a specified "mixing zone". The amount of ammonia which an individual plant can discharge must be determined for each facility and is dependent on existing receiving stream concentrations of ammonia, streamflow, and plant flow. In view of these numerous uncertaintities, an accurate estimation of costs was deemed impossible. It was assumed that the IEPA will enforce the ammonia standard on a case by case basis after careful evaluation of the above considerations after which costs for facilities may be estimated.

Costs borne by the public as a result of recommendations for miscellaneous, industrial, and other wastewater discharges would be secondary in nature and probably minor. Accordingly, they have not been estimated.

The costs for control of combined sewer overflows, as estimated for the facilities at Batavia, the Sanitary District of Elgin, and the Aurora Sanitary District, are shown below.

Facility	Capital Cost	Annual Operation and Main.
Batavia	Included in Facilities Plan	Included in Facilities Plan
SDE	$ 12,490,000	Unknown
ASD	$ 9,170,000	$110,000

The implementation of the Sanitary District of Elgin and the Aurora Sanitary District plans is uncertain and probably will not occur before 1983 based on the current IEPA grant priority numbers of 849 and 875 respectively. The Batavia plan, which is tied to expansion of the existing facilities, has received funding.

Table 19-33 summarizes the impact of the recommended plan on costs for individual treatment authorities.

b. Nonpoint Sources

Agricultural Runoff

Agricultural croplands presently total 239,900 acres in the Fox basin. This will decrease to 210,800 acres by the year 2000. In order to eliminate or reduce agricultural pollution from cropland, BMPs are targeted for implementation by the year 2000 on 140,700 acres at a total cost over the years of $23,940,000. Although a comprehensive farm plan would include a wide range of BMPs, the following four practices and several combinations have been recommended for implementation: conservation tillage, contouring, terracing, and cropland conversion to pastureland. These BMPs were selected because of their direct effects on water quality as well as their ability to reduce soil erosion.

Of the above total costs, $10,613,000 represent initial installation (or capital) expenditures for which grants may be made available from the federal government. The cost-sharing ratios are not yet defined but will probably be on the order of 50 percent. The balance of $13,327,000 represents operating and maintenance costs to the farmer over and above straight row plowing.

For estimating purposes, it is assumed that the BMPs will be installed to incur total expenditures of 30 percent by 1985, 70 percent by 1995, and 100 percent by the year 2000.

Urban Stormwater

Methods for controlling urban stormwater runoff pollution include street sweeping, catch basin cleaning, performance zoning, use of pervious pavements, increased vegetation, grass waterways, wetland storage of stormwater, stormwater detention, and erosion and sediment controls. The goals of a 25 percent decrease in pollutant loads on existing (1976) impervious surface and a 50 percent decrease in pollutant loads on impervious areas built between 1976 and 2000 are to be achieved by combinations of the above practices. The cost of the mix of specific practices which would meet these goals is dependent upon the practices selected and the intensity of their indivudal use. An estimate of the total cost based solely on street cleaning utilizing vacuum street sweepers is $56,327,000 through the year 2000, increasing from $1,338,000/year in 1978 to $3,560,000/year in the final year. The frequency of cleaning streets with vacuum sweepers averaged about once every 6.25 days during the year 2000, excluding the three winters months of December, January and February. The above costs did not include street cleaning in combined sewer areas where the stormwater runoffs would be treated. Naturally, some street cleaning activities would be required in those areas for sanitary or public relations reasons. Costs for that cleaning are not included in the above figures.

On-Site Disposal

The costs for recommendations to improve on-site disposal systems will largely be the responsibility of the individual owners of these systems. This private cost will vary from case to case and is impossible to estimate. The cost for extension of interceptor sewers to serve problem septic areas is included in existing facilities plans. Collector costs would be the responsibility of the homeowners benefiting from the new service and are too variable to estimate. Minor additional administrative costs to county health and development authorities are anticipated but are too small to estimate.

Other

The costs for implementation of recommendations concerning air pollution, sanitary landfills, materials storage, and de-icing controls would be minor or nonexistent and have not been estimated.

The costs for slotting of dams on the Fox River cannot be estimated until the feasibility of such an alternative has been evaluated.

d. Boundary Conditions

The costs for improved Fox River water quality as it enters Illinois would not be borne by the residents of the basin. It is likely these costs could be substantial and are evaluated in the 208 plan for the southeastern Wisconsin area.

e. Residuals

Additional treatment plant costs could result from recommendations calling for use of sludge as a soil conditioner and for treatment of septic sludge at existing municipal plants. These costs have not been estimated because of their site specific nature. No other substantial cost impacts are expected from recommendations on residuals.

f. Groundwater

Minor additional costs which were not estimated.

g. Inland Lakes

Costs were not determined because they are dependent upon the scope of any proposed projects.

h. Mining

Minor additional administrative costs are anticipated but have not been quantified.

TABLE 19-32 : RECOMMENDED PLANS, PUBLICLY OWNED TREATMENT SYSTEMS

FOX BASIN

MAP CODE	FACILITY NAME	DESIGN CAPACITIES (MGD)		EFFLUENT STANDARDS (Year 2000) (mg/l)				CAPITAL COSTS (million $)			COMMENTS
		1975	2000	BOD_5	TSS	P	NH_3N	INITIAL	FUTURE	TOTAL	
M1	Algonquin	0.85	2.12	20	25		(1)	-	2.5	2.5	(1) NH_3 standard is 1.5 mg/l in-stream after mixing. (2) costs include nitrification but do not include combined sewer work; or year 2000 Phase II expansion to 50.0 mgd. (3) Single stage activated sludge will provide nitrification. (4) costs include control of combined sewer overflows. (5) expansion to 5 mgd essentially complete; costs are for phase out of Kimbal Hill (K3). (6) plant utilizing rotating biodiscs to meet ammonia standard; phosphorous standard necessary because plant is upstream from a lake. (7) costs include single stage nitrification, intercepting sewers and land; expansion to 17.0mgd assumed complete, costs not included. (8) rotating biodiscs provide nitrification; two 6.0 mgd expansions planned before year 2000. (9) only minor costs anticipated. (10) lagoon exemption assumed. (11) costs include sewers. (12) NH_3 removal facilities to be provided. (13) future costs included 3.5 mgd regional plant to serve McHenry, McCullom Lake and McHenry Shores; see M16.
K1	Aurora	32.00	40.00	10	12		(1)	(2) 73.3	-	73.3	
L2	Barrington	2.00	3.68	10	12		(1) (3)	4.2	-	4.2	
K2	Batavia	2.72	5.20	20	25		(1)	(4) 6.7	-	6.7	
K4	Carpentersville Main	3.50	(5) 5.00	20	25		(1)	0.8	-	0.8	
M2	Cary	1.26	2.77	20	25		(1)	-	4.2	4.2	
M3	Crystal Lake No.1,2	4.50	7.00	10	12		(1)	-	8.6	8.6	
M4	Crystal Lake No. 3	0.50	2.00	10	12	(6) 1	(1)	-	see M3	see M3	
K5	East Dundee	0.58	0.97	30	30		(1)	1.8	0	1.8	
K6	Elburn	0.11	1.27	10	12		(1)	3.1	0.7	3.8	
K7	Elgin S.D.- North	3.50	3.50	20	25		(1)	-	-	-	
K8	Elgin S.D.-Main	8.60	25.0	10	12		(1)	(7) 13.0	-	13.0	
L5	Fox Lake	0.72	12.00	10	12	1	(8) (1)	10.0	8.8	18.8	
M5	Fox River Grove	0.39	1.25	30	30		(1)	2.9	-	2.9	
K11	Geneva	4.00	4.00	20	25		(1)	(9)	-	-	
M7	Hebron	0.11	0.19	(10) 30	(10) 30		(1)	0.5	0.1	0.6	

TABLE 19-32 : RECOMMENDED PLANS, PUBLICLY OWNED TREATMENT SYSTEMS

FOX BASIN

MAP CODE	FACILITY NAME	DESIGN CAPACITIES (MGD)		EFFLUENT STANDARDS (Year 2000) (mg/l)				CAPITAL COSTS (million $)			COMMENTS
		1975	2000	BOD_5	TSS	P	NH_3N	INITIAL	FUTURE	TOTAL	
L10	Island Lake S.D.	0	1.20	20	25		(1)	(1) 5.9	-	5.9	(14) costs are for new interceptors PO_4 removal because plant is upstream from a lake. (15) initial costs for .25 mgd McHenry Shores plant; future costs share of 3.5 mgd regional plant; See M11.
M9	Lake in Hills S.D.	0.25	0.85	10	12		(1) (12)	1.4	-	1.4	
L21	Lake Zurich N.W.	0.80	1.00	10	12		(1)	0.3	1.1	1.4	
M11	McHenry	2.00	3.00	20	25		(1)	-	(13) 4.9	4.9	
M12	Richmond	0.38	0.38	30	30	1	(1)	-	-	-	
K16	St. Charles	8.00	8.00	20	25		(1)	(9) -	-	-	
L32	Wauconda	0.80	1.20	10	12		(1)	3.0	-	3.0	
K18	West Dundee	0.50	0.90	30	30		(1)	2.4	-	2.4	
M14	Woodstock N.	3.50	3.50	10	12	1	(1)	-	(14) 1.9	-	
M16	McHenry Shores	0	3.50	20	25		(1)	(15) 1.5	1.6	3.1	
K19	Wasco S.D.	0	0.13	(10) 30	30		(1)	0.4	-	0.4	
K20	Sugar Grove	0	0.30	10	12		(1)	1.0	-	1.0	

TABLE 19-33 SUMMARY OF FUTURE COSTS (All data in 1977 dollars in millions)

Jurisdiction	Capital Costs						Annual Operations & Maintenance Expense				
	1978-1982	1983-1987	1988-1992	1993-1997	1998-2000	Total	1978-1982 (aver.)	1983-1987 (aver.)	1988-1992 (aver.)	1993-1997 (aver.)	1998-2000 (aver.)
MSDGC	37.90	0.30				38.20	0.09	0.33	0.35	0.35	0.35
Local Improvements Related to MSDGC	16.00	2.60				18.60					
Barrington	3.79					3.79	0.19	0.24	0.24	0.24	0.24
Aurora Sanitary District	72.56					72.56	1.43	1.79	1.79	1.79	1.79
Elgin Sanitary District	15.54					15.54	0.31	0.51	0.51	0.51	0.51
Batavia	6.69					6.69	0.14	0.18	0.18	0.18	0.18
Carpentersville	0.76					0.76					
East Dundee	1.65					1.65	0.04	0.21	0.21	0.21	0.21
Elburn	3.10					3.10	0.06	0.07	0.07	0.07	0.07
Geneva	0.03					0.03					
St. Charles	0.05					0.05					
Sugar Grove	0.96					0.96	0.03	0.08	0.08	0.08	0.08
West Dundee	2.93					2.93	0.26	0.32	0.32	0.32	0.32
Wasco	0.01	0.35				0.36	0.01	0.01	0.01	0.01	0.01
Antioch	0.57					0.57		0.03	0.08	0.08	0.08
Fox Lake	10.07	1.17	2.93	2.93	1.77	18.87	0.13	0.24	0.30	0.30	0.30
Lake Villa	0.50					0.50		0.01	0.01	0.01	0.01
Lake Zurich	0.30	1.02			1.32			1.10	0.26	0.26	0.26

TABLE 19-33 SUMMARY OF FUTURE COSTS (All data in 1977 dollars in millions)

Jurisdiction	Capital Costs						Annual Operations & Maintenance Expense				
	1978-1982	1983-1987	1988-1992	1993-1997	1998-2000	Total	1978-1982 (aver.)	1983-1987 (aver.)	1988-1992 (aver.)	1993-1997 (aver.)	1998-2000 (aver.)
Round Lake	0.19					0.19	0.20	0.32	0.44	0.44	0.44
LCDPW	18.82	0.80	2.00	2.00	1.20	24.82					
Wauconda	2.91					2.91	0.07	0.09	0.09	0.09	0.09
Algonquin		2.23				2.23		0.07	0.17	0.17	0.17
Cary		3.90				3.90		0.13	0.32	0.32	0.32
Crystal Lake		8.24				8.24		0.16	0.40	0.40	0.40
Hebron	0.51	0.04	0.03			0.58	0.02	0.03	0.03	0.03	0.03
McHenry Shores	1.53	1.42				2.95	0.01	0.05	0.09	0.09	0.09
McHenry Village	0.13	5.13				5.26		0.05	0.12	0.12	0.12
Island Lake	7.76					7.76	0.06	0.08	0.08	0.08	0.08
Woodstock		0.25	0.63	0.64	0.38	1.90					
Lake In The Hills	1.21					1.21	0.06	0.08	0.08	0.08	0.08
Fox River Grove	2.88					2.88	0.07	0.09	0.09	0.09	0.09
Agricultural BMPs							0.23	0.54	0.74	1.07	1.29
Urban Stormwater Mgmt Exp.							1.78	2.23	2.67	3.12	3.47
TOTAL	209.35	27.45	5.59	5.57	3.35	251.31	5.19	8.04	9.73	10.51	11.08

TABLE 19-34 : PROJECTED ANNUALIZED LOCAL COSTS (All data in 1977 dollars in millions)

Jurisdiction	CAPITAL COSTS			LOCAL CAPITAL PLUS O & M ANNUALIZED Costs (Mil./yr.)*					Comments
	Cost Total Through Yr. 2000	Est. Fed'l. Share	Est. Local Share	1978-1982	1983-1987	1988-1992	1993-1997	1998-2000	
MSDGC	38.20	28.65	9.55	0.98	1.23	1.25	1.25	0.36	
Local Improvements Related to MSDGC	18.60	13.95	4.65	0.38	0.44	0.44	0.44	0.06	
Barrington	3.79	2.84	0.95	0.29	0.34	0.34	0.34	0.24	
Aurora Sanitary District	72.56	54.46	18.14	3.14	3.50	3.50	3.50	1.79	
Elgin Sanitary District	15.54	11.66	3.88	0.60	0.88	0.88	0.88	0.63	
Batavia	6.69	5.02	1.67	0.30	0.34	0.34	0.34	0.18	
Carpentersville	0.76	0.57	0.19	0.01	0.02	0.02	0.02	0.01	
East Dundee	1.65	1.24	0.41	0.06	0.25	0.25	0.25	0.15	
Elburn	3.10	2.32	0.78	0.13	0.14	0.14	0.14	0.07	
Geneva	0.03	0.02	0.01	0.001	0.001	0.001	0.001		
St. Charles	0.05	0.04	0.01	0.001	0.001	0.001	0.001		
Sugar Grove	0.96	0.72	0.24	0.04	0.10	0.10	0.10	0.10	
West Dundee	2.93	2.20	0.73	0.33	0.39	0.39	0.39	0.32	
Wasco	0.36	0.27	0.09	0.01	0.02	0.02	0.02	0.02	
Antioch	0.57	0.43	0.14	0.01	0.04	0.09	0.09	0.08	
Fox Lake	18.87	14.16	4.71	0.37	0.49	0.63	0.70	0.51	
Lake Zurich	1.32	0.99	0.33	0.01	0.12	0.29	0.29	0.29	
Round Lake	0.19	0.14	0.05	0.20	0.32	0.44	0.44	0.44	

*Local Capital Amortized @ 7% for 20 yrs.

TABLE 19-34: PROJECTED ANNUALIZED LOCAL COSTS (All data in 1977 dollars in millions)

Jurisdiction	CAPITAL COSTS			LOCAL CAPITAL PLUS O & M ANNUALIZED Costs (Mil./yr.)*					Comments
	Cost Total Through Yr. 2000	Est. Fed'l. Share	Est. Local Share	1978-1982	1983-1987	1988-1992	1993-1997	1998-2000	
Lake County Public Works	24.82	18.62	6.20	0.44	0.45	0.51	0.56	0.14	
Wauconda	2.91	2.18	0.73	0.14	0.16	0.16	0.16	0.09	
Algonquin	2.23	1.67	0.56		0.10	0.12	0.12	0.12	
Cary	3.90	2.92	0.98		0.19	0.41	0.41	0.41	
Crystal Lake	8.24	6.18	2.06		0.28	0.59	0.59	0.59	
Hebron	0.58	0.44	0.14	0.03	0.04	0.04	0.04	0.03	
McHenry Shores	2.95	2.21	0.74	0.03	0.11	0.16	0.16	0.12	
McHenry Village	5.26	3.94	1.32	0.003	0.13	0.24	0.24	0.24	
Island Lake	7.76	5.52	1.94	0.23	0.26	0.26	0.26	0.01	
Woodstock	1.90	1.42	0.48			0.02	0.04	0.04	
Lake in the Hills	1.21	0.91	0.30	0.09	0.11	0.11	0.11	0.08	
Fox River Grove	2.88	2.16	0.72	0.14	0.16	0.16	0.16	0.09	
Agricultural BMPs				0.23	0.54	0.74	1.07	1.29	
Urban Stormwater Mgmt. Exp.				1.78	2.23	2.67	3.12	3.47	
TOTAL	251.31	188.49	62.82	9.98	13.40	15.33	16.25	11.98	

*Local Capital Amortized @ 7% for 20 yrs.

TABLE 19-35: PROJECTED AVERAGE ANNUAL INCREASE IN HOUSEHOLD WASTEWATER COST

DU PAGE COUNTY

	1978-1982 (aver.)	1983-1987 (aver.)	1988-1992 (aver.)	1993-1997 (aver.)	1998-2000 (aver.)	Comments
Assessed Valuation (Mil. $)	126.4	142.7	159.0	175.3	188.3	
Additional Ad Valorem Rate: ($/$100 A.V.)						
Capital Related	.067	.060	.056	.052		
O & M Related	.127	.148	.151	.156	.159	
Total Rate:	.194	.208	.207	.208	.159	
Additional Cost per Home of $45,000 FMV ($/yr.)	29.10	31.20	31.05	31.20	23.85	
Existing Av. Annual WW Cost ($/Household yr.)	84.75					
Total Av. Annual WW Cost ($ / Household yr.)	113.85	115.95	115.80	115.95	108.60	
Percent Av. Increase* in WW Costs per Household (%)	34.3	36.8	36.6	36.8	28.1	

*Total Rate Used

TABLE 19-35: PROJECTED AVERAGE ANNUAL INCREASE IN HOUSEHOLD WASTEWATER COST MCHENRY COUNTY

	1978-1982 (aver.)	1983-1987 (aver.)	1988-1992 (aver.)	1993-1997 (aver.)	1998-2000 (aver.)	Comments
Assessed Valuation (Mil. $)	532.1	600.7	669.1	737.6	792.3	
Additional Ad Valorem Rate: ($/$100 A.V.)						
Capital Related	.042	.085	.091	.086	.049	
O & M Related	.107	.210	.301	.292	.285	
Total Rate:	.149	.295	.392	.378	.334	
Additional Cost per Home of $45,000 FMV ($/yr.)	22.35	44.25	58.80	56.70	50.10	
Existing Av. Annual WW Cost ($/Household yr.)	59.72					
Total Av. Annual WW Cost ($ / Household yr.)	82.07	103.97	118.52	116.42	109.82	
Percent Av. Increase* in WW Costs per Household (%)	37.4	74.1	98.5	94.9	83.9	

*Total Rate Used

TABLE 19-35 : PROJECTED AVERAGE ANNUAL INCREASE IN HOUSEHOLD WASTEWATER COST BASIN TOTAL

	1978-1982 (aver.)	1983-1987 (aver.)	1988-1992 (aver.)	1993-1997 (aver.)	1998-2000 (aver.)	Comments
Assessed Valuation (Mil. $)	2873.6	3243.5	3613.1	3983.2	4278.8	
Additional Ad Valorem Rate: ($/$100 A.V.)						
Capital Related	.153	.166	.159	.148	.042	
O & M Related	.181	.248	.269	.264	.259	
Total Rate:	.334	.414	.428	.412	.301	
Additional Cost per Home of $45,000 FMV ($/yr.)	50.10	62.10	64.20	61.80	45.15	
Existing Av. Annual WW Cost ($/Household yr.)	84.75					
Total Av. Annual WW Cost ($ / Household yr.)	134.85	146.85	148.95	146.55	129.90	
Percent Av. Increase* in WW Costs per Household (%)	59.1	73.3	75.8	72.9	53.3	

*Total Rate Used

TABLE 19-35 : PROJECTED AVERAGE ANNUAL INCREASE IN HOUSEHOLD WASTEWATER COST

COOK COUNTY - Non MSDGC

	1978-1982 (aver.)	1983-1987 (aver.)	1988-1992 (aver.)	1993-1997 (aver.)	1998-2000 (aver.)	Comments
Assessed Valuation (Mil. $)	182.5	205.9	229.4	252.9	271.7	
Additional Ad Valorem Rate: ($/$100 A.V.)						
Capital Related	.075	.077	.071	.065	.015	
O & M Related	.173	.218	.212	.212	.210	
Total Rate:	.248	.295	.283	.277	.225	
Additional Cost per Home of $45,000 FMV ($/yr.)	37.20	44.25	42.45	41.55	33.75	
Existing Av. Annual WW Cost ($/Household yr.)	84.75					
Total Av. Annual WW Cost ($ / Household yr.)	121.95	129.00	127.20	126.30	118.50	
Percent Av. Increase* in WW Costs per Household (%)	43.9	52.2	50.1	49.0	39.8	

*Total Rate Used

TABLE 19-35 : PROJECTED AVERAGE ANNUAL INCREASE IN HOUSEHOLD WASTEWATER COST

KANE COUNTY

	1978-1982 (aver.)	1983-1987 (aver.)	1988-1992 (aver.)	1993-1997 (aver.)	1998-2000 (aver.)	Comments
Assessed Valuation (Mil. $)	1422.4	1605.5	1788.5	1971.7	2118.0	
Additional Ad Valorem Rate: ($/$100 A.V.)						
Capital Related	.153	.142	.127	.115	.008	
O & M Related	.219	.268	.259	.255	.250	
Total Rate:	.372	.410	.386	.370	.258	
Additional Cost per Home of $45,000 FMV ($/yr.)	55.80	61.50	57.90	55.50	38.70	
Existing Av. Annual WW Cost ($/Household yr.)	72.77					
Total Av. Annual WW Cost ($ / Household yr.)	128.57	134.27	130.67	128.27	111.47	
Percent Av. Increase* in WW Costs per Household (%)	76.7	84.5	79.6	76.3	53.2	

*Total Rate Used

TABLE 19-35: PROJECTED AVERAGE ANNUAL INCREASE IN HOUSEHOLD WASTEWATER COST LAKE COUNTY

	1978-1982 (aver.)	1983-1987 (aver.)	1988-1992 (aver.)	1993-1997 (aver.)	1998-2000 (aver.)	Comments
Assessed Valuation (Mil. $)	425.8	480.6	535.6	590.2	634.0	
Additional Ad Valorem Rate: ($/$100 A.V.)						
Capital Related	.212	.202	.203	.204	.060	
O & M Related	.189	.271	.340	.329	.319	
Total Rate:	.401	.473	.543	.533	.379	
Additional Cost per Home of $45,000 FMV ($/yr.)	60.15	70.95	81.45	79.95	56.85	
Existing Av. Annual WW Cost ($/Household yr.)	75.40					
Total Av. Annual WW Cost ($ / Household yr.)	135.55	146.35	156.85	155.35	132.35	
Percent Av. Increase* in WW Costs per Household (%)	79.8	94.1	108.0	106.0	75.4	

*Total Rate Used

19.12 WATER QUALITY CONDITIONS IN 1983

a. Introduction

Public Law 92-500 includes the state ment "Wherever attainable, an interim goal of water quality which provides for the protection and propagation of fish, shellfish, and wildlife, and provides for recreation in and on the water be achieved by July 1, 1983." The water quality standards of the Illinois Pollution Control Board for General Use streams, such as Fox, were adopted to "protect the State's water for aquatic life,. . . . .primary and secondary contact use, ..." This Commission is using the Illinois standards, as modified by this plan, to judge compliance with the 1983 national goal. This chapter assesses the feasibility of compliance with the dissolved oxygen and ammonia standards in 1983 in the Fox River Basin.

b. Assumptions of Changes in the Basin

(1) Land Cover

Land cover estimates for the years 1976, 1983, and 2000 are summarized in Table 19-36. It may be noted that impervious area is forecast to increase by 33 percent from 1976 to 2000. Also forecast is some shifting from cropland to grassland. The cropland areas listed under "conservation" indicate those lands where additional soil conservation practices are expected to be implemented.

Table 19-36: Land Cover Changes

	Area in Square Miles		
Cover Type	1976	1983	2000
Lowland	175.4	175.4	175.4
Cropland	265.5	252.9	224.9
Conservation	(0)	(28.1)	(156.1)
Grassland	421.8	428.9	444.7
Impervious	55.5	61.1	73.7

(2) Urban Runoff Control

Management measures are to be implemented with the objective of reducing runoff-related pollutants from existing urbanized areas by 25 percent of loadings found to be present in 1976.

The loadings from areas urbanized after that year are to be reduced by 50 percent of 1976 loads. This will result in an overall 27 percent reduction in urban runoff pollution loads by 1983.

(3) Point Sources

Effluent characteristics of major point sources modeled for the Fox Basin are given for 1976 and 1983 in Table 19-37.

Table 19-37: Fox River Basin 1983 Condition of Point Sources

Plant Name	Reach	Flow (cfs)	BOD_5 (mg/l)	NH_3 (mg/l)	Soluble PO_4 (mg/l)
Algonquin	370	1.65	20	7.19	1.5
Antioch	113	0.94	10	10.0	0.97
Barrington	270	4.88	10	1.5	1.5
Batavia	480	2.97	20	10.0	1.5
Carpentersville Kimble Hill	370	PHASED OUT			
Carpentersville Main	370	12.64	20	7.19	1.5
Cary	310	2.78	20	7.3	1.5
Crystal Lake #1 and #2	310	6.87	10	9.14	1.5
Crystal Lake #3	310	1.56	10	4.0	0.71
E & W Dundee	370	0.61	30	13.0	1.5
Elgin North	370	7.02	20	13.0	1.5
Elgin Main	370	18.0	10	4.0	1.5
Elgin West	370	PHASED OUT			
St. Charles	480	8.96	10	6.21	1.5
St. Charles Skyline	480	PHASED OUT			
Wauconda	310	1.05	10	4.0	0.80
Woodstock North	31	4.19	10	10.0	0.80
Rollins Sewer & Water	430	0.28	17	2.56	0.80
Round Lake	117	PHASED OUT			

Table 19-37 (Cont'd.)

Plant Name	Reach	Flow (cfs)	BOD_5 (mg/l)	NH_3 (mg/l)	Soluble PO_4 (mg/l)
Fox Lake	121	6.30	30	4.0	0.80
Fox Lake O.C.	121	0.05	11	5.10	0.27
Fox River Grove	310	1.07	20	7.30	1.5
Geneva	480	5.01	20	10.0	1.5
Hebron	106	0.33	30	12.7	1.5
Island Lake	310	1.01	20	7.3	1.5
Lake-in-the-Hills	310	1.49	10	1.5	3.70
Lake Villa	117	0.38	20	5.10	0.80
Lake Zurich N.W.	270	2.37	12	8.51	1.5
McHenry	310	5.92	20	5.1	1.5
MSDGC Streamwood	360	PHASED OUT			
Richmond	106	0.24	30	5.1	0.80
Valley High Nursing	31	0.12	10	0.65	0.80
Wonder Lake	31	PLANT NOT CONSTRUCTED			
Morton Chemical	310	0.50	1	1.0	0.01
Illinois Youth Center	480	0.86	8	0.32	0.12
Fermi Laboratory	480	0.07	6	6.3	0.65

c. Expected Water Quality in 1983

The water quality model was used indirectly to estimate 1983 water quality conditions. Results of 1976 and year 2000 First Test Plan served as the basis for estimating 1983 values. In the process, pollution loads to the river were calculated for each of those three years. These loads are reported in Table 19-38 for 13 reaches, along with the water quality ratings for dissolved oxygen and ammonia associated with the loads. The ratings for 1976 and 2000 are from previous water quality modeling results. The 1983 ratings are informed judgments.

TABLE 19-38 WATER QUALITY RATINGS IN 1983

Reach 31, Nippersink Creek at Thompson Road

Loads & Ratings	1976	1983	2000
Phosphorous, tons/year	20	19	20
BOD, tons/year	369	290	434
Ammonia, tons/yr.	50	64	50
Dissolved Oxygen	Good	Good	Good
Ammonia	Good	Good	Good

Reach 106, Nippersink Creek at Nippersink Lake

Loads & Ratings	1976	1983	2000
Phosphorous, tons/year	56	36	38
BOD, tons/year	849	562	688
Ammonia, tons/yr.	91	89	77
Dissolved Oxygen	Good	Good	Good
Ammonia	Exc.	Exc.	Exc.

Reach 113, Grass Lake Outlet

Loads & Ratings	1976	1983	2000
Phosphorous, tons/year	106	97	96
BOD, tons/year	11606	11553	5033
Ammonia, tons/yr.	156	148	139
Dissolved Oxygen	Exc.	Good	Good
Ammonia	Exc.	Exc.	Exc.

Reach 117, Squaw Creek Outlet

Loads & Ratings	1976	1983	2000
Phosphorous, tons/year	18	8	7
BOD, tons/year	240	121	119
Ammonia, tons/yr.	80	12	10
Dissolved Oxygen	Good	Good	Good
Ammonia	Bad	Good	Good

Reach 121, Fox River at Johnsburg

Loads & Ratings	1976	1983	2000
Phosphorous, tons/year	188	150	154
BOD, tons/year	12882	12610	6085
Ammonia, tons/yr.	346	278	289
Dissolved Oxygen	Fair	Good	Good
Ammonia	Exc.	Exc.	Exc.

Reach 270, Flint Creek

Loads & Ratings	1976	1983	2000
Phosphorous, tons/year	18	16	14
BOD, tons/year	252	216	223
Ammonia, tons/yr.	66	38	105
Dissolved Oxygen	Good	Good	Good
Ammonia	Poor	Fair	Bad

Reach 300, Spring Creek

Loads & Ratings	1976	1983	2000
Phosphorous, tons/year	4	4	4
BOD, tons/year	72	66	69
Ammonia, tons/yr.	7	8	8
Dissolved Oxygen	Good	Good	Good
Ammonia	Good	Good	Good

Reach 310, Fox River at Algonquin

Loads & Ratings	1976	1983	2000
Phosphorous, tons/year	242	210	206
BOD, tons/year	13788		7516
Ammonia, tons/yr	504	439	582
Dissolved Oxygen	Fair	Good	Good
Ammonia	Good	Good	Good

TABLE 19-38 (CONT.)

Reach 340, Tyler Creek

Loads & Ratings	1976	1983	2000
Phosphorous, tons/year	13	7	6
BOD, tons/year	147	103	112
Ammonia, tons/yr.	15	9	8
Dissolved Oxygen	Exc.	Exc.	Exc.
Ammonia	Fair	Fair	Fair

Reach 360, Poplar Creek

Loads & Ratings	1976	1983	2000
Phosphorous, tons/year	11	7	6
BOD, tons/year	158	117	129
Ammonia, tons/yr	31	13	13
Dissolved Oxygen	Good	Good	Good
Ammonia	Good	Good	Good

Reach 370, Fox River at Valley View

Loads & Ratings	1976	1983	2000
Phosphorous, tons/year	320	311	351
BOD, tons/year	14880	15271	9653
Ammonia, tons/yr	891	826	1309
Dissolved Oxygen	Fair	Fair	Fair
Ammonia	Good	Good	Good

Reach 430, Otter Creek

Loads & Ratings	1976	1983	2000
Phosphorous, tons/year	19	19	19
BOD, tons/year	196	187	201
Ammonia, tons/yr	21	21	21
Dissolved Oxygen	Good	Good	Good
Ammonia	Fair	Fair	Fair

Reach 480, Fox River at Montgomery Dam

Loads & Ratings	1976	1983	2000
Phosphorous, tons/year	378	384	404
BOD, tons/year	15820	16384	11183
Ammonia, tons/yr	1059	1131	1621
Dissolved Oxygen	Fair	Fair	Fair
Ammonia	Good	Good	Good

The goal (expressed in terms of achievement of water quality standards) is considered to be met satisfactorily when a rating of "good" or "excellent" is achieved. Assignment of these adjective ratings was based on the following criteria:

Excellent = no dissolved oxygen concentrations below 5 mg/l.
Good = dissolved oxygen remains above 5 mg/l 95 percent of the time or more.
Fair = dissolved oxygen remains above 5 mg/l 85 percent of the time or more.
Poor = dissolved oxygen remains above 5 mg/l 70 percent of the time or more.
Bad = dissolved oxygen remains above 5 mg/l less than 70 percent of the time.

In any reach where the dissolved oxygen drops to zero, the qualitative state of the reach is lowered by one category. Ammonia ratings are based on a maximum concentration of 1.5 mg/l for the same criteria as dissolved oxygen above.

The standards for dissolved oxygen and ammonia appear to be met or not met in 1983 as noted in Table 19-39:

TABLE 19-39: AMMONIA AND DISSOLVED OXYGEN RATINGS IN 1983

Stream	Reach	Dissolved Oxygen	Ammonia
Nippersink Creek	31	Good	Good
Nippersink Creek	106	Good	Excellent
Grass Lake Outlet	113	Good	Excellent
Squaw Creek	117	Good	Good
Fox River: Johnsburg	121	Good	Excellent
Flint Creek	270	Good	Fair
Spring Creek	300	Good	Good
Fox River: Algonquin	310	Good	Good
Tyler Creek	340	Excellent	Fair
Poplar Creek	360	Good	Good
Fox River: Valley View	370	Fair	Good
Otter Creek	430	Good	Fair
Fox River: Montgomery	480	Fair	Good

The "fair" rating for ammonia in Reach 270 represents an improvement over existing conditions largely because the Barrington plant is expected to be operating ammonia removal facilities by 1983. Point sources will still account for 71 percent of the ammonia load to Reach 270 in 1983. Further improvement may be expected when the Lake Zurich Northwest plant implements ammonia removal.

The "fair" rating for ammonia in Reach 340 appears to be the result of surface runoff from cropland, grassland and impervious sources. Improved nonpoint pollution control practices between 1983 and 2000 could help to improve this rating but probably won't be sufficient to achieve a "good" rating. Modeling assumptions concerning ammonia loads from nonpoint sources in this reach should be carefully evaluated.

Reaches 370 and 480, the two most downstream reaches on the mainstem of the Fox River, have both received "fair" ratings for dissolved oxygen in 1983. Although upstream reaches have good water quality about half of the oxidizable materials entering Reaches 370 and 480 comes from boundary conditions. The loads from boundary conditions keep these reaches in a stressed state and the impacts from point and nonpoint loads within these reaches causes dissolved oxygen ratings to be "fair". Possible alternatives for improving the "fair" ratings to "good" include the slotting of dams to increase flow velocity and thereby stream assimilative capacity and the enforcement of 10/12 effluent standards to decrease point source loads. It is possible that assumptions concerning wastewater loads to point sources in the Fox basin may be overestimated based on recent population forecasts from the Illinois Bureau of the Budget. If this is true, point source loads could be lower and effluent quality could be higher than assumed resulting in a better water quality rating. Further examination of this possibility is needed.

Reach 430 received a "fair" rating for ammonia in 1983. Virtually all of the ammonia reaches the stream in surface runoff. The implementation of further nonpoint pollution control alternatives should help the problem but not enough to merit a "good" rating. As in Reach 340, modeling assumptions concerning nonpoint ammonia loads should be reevaluated in the light of site specific data if possible.

Although phosphorous has not received a rating, it is still an important pollutant since it is the limiting nutrient in the Fox basin for algal growth. Phosphorous loads from point sources below Johnsburg Road will increase but this will be offset by decreases in nonpoint loads. The impact of increased point source phosphorous contributions was discussed in Section 19.09. Assumptions concerning phosphorous loads from point sources below Johnsburg Road should be reevaluated in light of site specific data.

d. Evaluation

On the basis of the preceding analysis, it appears that the 1983 goal for dissolved oxygen will not be met in Reaches 370 and 480 and the 1983 goal for ammonia will not be met in Reaches 270, 340 and 430.

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